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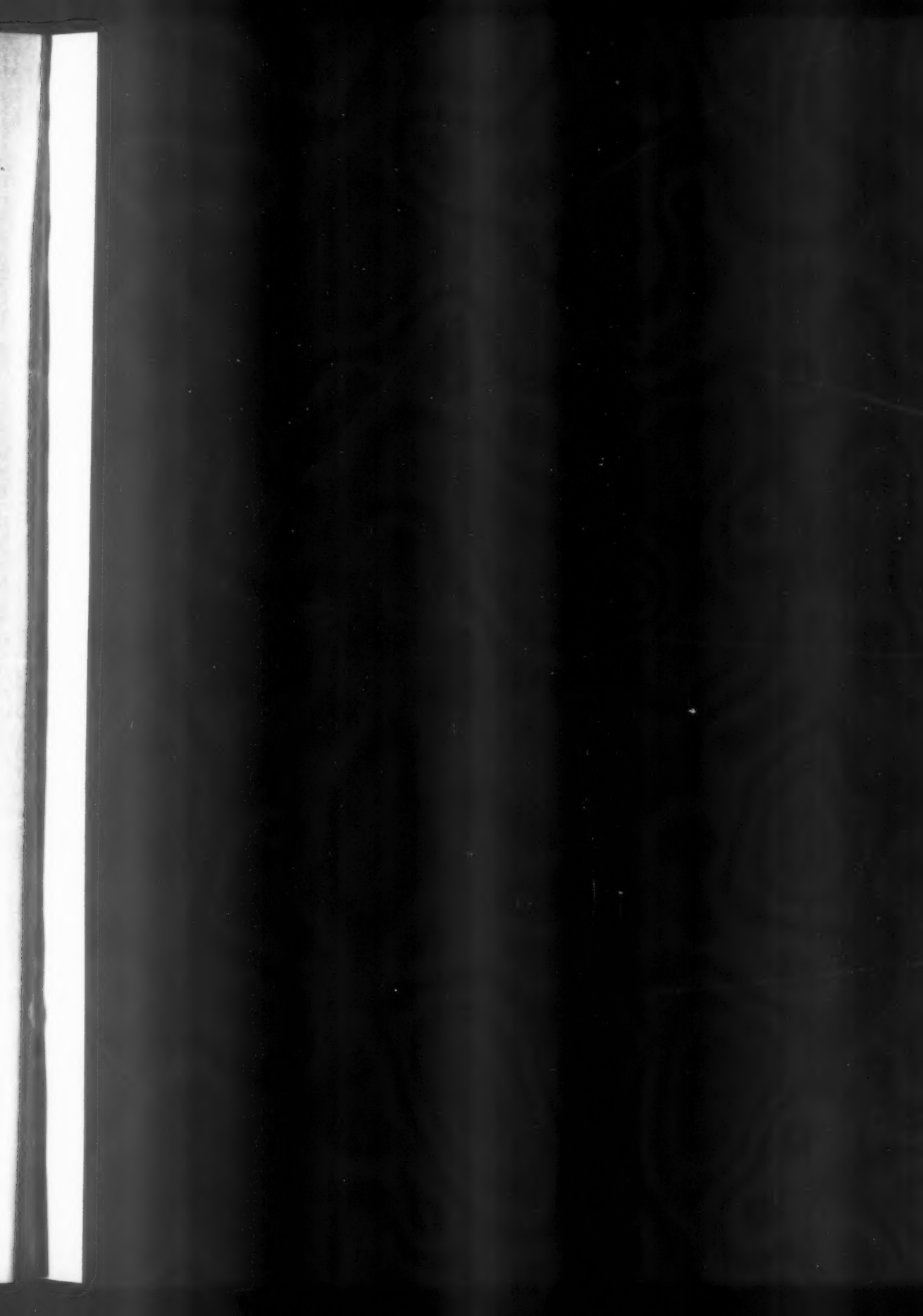

MUNICIPAL ENGINEERING

VOLUME XXV AUGUST, NINETEEN HUNDRED THREE NUMBER TWO

PORTLAND CEMENT MANUFACTURE.

EXCAVATION OF THE RAW MATERIALS.

By Edwin C. Eckel, U. S. Geological Survey, Washington, D. C.

In the present paper some account will be given of the excavation and transportation to mill of the raw cement materials and the cost of this service.

The natural raw materials used at present are obtained by one of three methods: (a) quarrying, (b) mining, and (c) dredging. The choice between these different methods of excavation will depend partly on the physical character of the material to be excavated, and partly on topographic and geologic conditions.

a. Quarrying. The term "quarrying" is here used to cover all methods of obtaining dry material from open cuts or pits, whether the material excavated be a limestone, shale or clay. Quarrying is the most natural and common method of obtaining cement materials. If marl (which is usually worked by dredging) be excluded from consideration it is probably within bounds to say that 95 per cent. of the materials used in American Portland cement manufacture are obtained from open cuts or pits.

In the majority of quarries the material is blasted out and loaded by hand onto cars or carts. In a few limestone quarries this method is improved by using a steam shovel to do the loading. Steam shovels are more frequently employed for this purpose in shale quarries. In certain clay and shale pits, where the materials are of such character as to permit it, the steam shovel does all the work, both excavating and loading the materials, drilling and blasting being unnecessary.

The rock is usually shipped to the mill as quarried, without any treatment except sledging it to convenient size for loading. At a few quarries, however, a crushing plant is installed at the quarry, the rock being shipped to the mill as crushed stone.

b. Mining. The term "mining" is used in the present paper, in distinction from "quarrying," to cover methods of obtaining materials by underground work, through shafts or tunnels. Mining is rarely employed, in dealing with materials of so little unit value as are employed in Portland cement manufacture. Occasionally, however, when a thin bed of limestone or shale is being worked, its dip will carry it under such a thickness of other rock as to make mining cheaper than quarrying for that particular case. There are a few advantages in mining cement materials that serve to partly counterbalance the greater cost per ton as compared with quarrying. A mine can be worked economically in all kinds of weather, while a quarry is commonly in a more or less crippled condition for about three months of the year. Material mined is, moreover, always dry and clean.

c. Dredging. The term "dredging" is here used to cover all methods of excavating soft and wet, raw materials. Material of such a character as to be excavated by dredging will necessarily occur in depressions; and the deposit, in addition to containing much water diffused throughout its mass, may be covered by a more or less considerable depth of water. This may involve draining the deposit before dredging can be commenced.

The only cement material extensively worked by dredging, in the United States, is marl. Occasionally clay is obtained from deposits covered by more or less water, but this is rarely practiced unless marl occurs associated with the clay. In dredging marl the excavator is usually mounted on a barge, which floats in a channel resulting from previous excavation. Occasionally the shovel is mounted

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on a car, running on tracks laid along the edge of the marl deposit.

The material brought up by the bucket may be sent to the mill in two different ways. At plants using dome or chamber kilns, or at other plants where the cement mixture is not made very wet, the excavated marl is usually deposited in cars, hauled to the mill by horse or steam power. At plants using a really wet process, however, it is probable that the second method is more economical. This consists in dumping the marl into tanks on the bank, adding sufficient water to make it flow readily and pumping the fluid to the mill.

Transportation to mill. The method of transporting the raw materials to the mill is almost entirely a question of distance and grade. Most cement mills are located close to at least one of their raw materials, and the commonest method of handling and transportation is probably to load the material by hand at the quarry face, run the cars by horse-power to a point where they are fastened to a cable which hauls them up to the mill. Where a hill or ravine intervenes between quarry and mill, or where there is a great difference in elevation between the two points, it is probable that an aerial cableway will prove to be the most satisfactory method of transportation.

Cost of Raw Materials at Mill. The most natural way, perhaps, to express the cost of the raw materials delivered at the mill would be to state it as being so many cents per ton or cubic yard of raw material; and this is the method followed by quarrymen or miners in general. To the cement manufacturer, however, such an estimate is not so suitable as one based on the cost of raw materials per ton or barrel of finished cement.

In the case of hard and comparatively dry limestones or shales, it may be considered that the raw material loses 33 1-3 per cent. in weight on burning. Converting this relation into pounds of raw material and of clinker we find that 600 pounds of dry raw material will make about 400 pounds of clinker. Allowing something for other losses in the process of manufacture, it is convenient and sufficiently accurate to estimate that 600 pounds of dry raw material will give one barrel of finished cement. These estimates must be increased if the raw materials carry any appreciable amount of water. Clays will frequently contain 15 per cent. or more of water; while soft chalky limestones, if quarried during wet weather, may carry as high as 15 to over 20 per cent. A Portland cement mixture composed of a pure chalky limestone and a clay might, therefore, average 10 to 20 per cent. of water; and consequently about 700 pounds of such a mixture would be required to make one barrel of finished cement.

With marls the loss on drying and burning is much greater. Russell states* that according to determinations made by E. D. Campbell, one cubic foot of marl as it usually occurs in the natural deposits contains about 47½ pounds of lime carbonate and 48 pounds of water. In making cement from a mixture of marl and clay, therefore, it would be necessary to figure on excavating and transporting over 1,000 pounds of raw material for every barrel of finished cement.

From the preceding notes it will be understood that the cost of raw materials at the mill, per barrel of cement, will vary not only with the cost of excavation but with the kind of materials in use.

In dealing with hard dry materials, extracted from open quarries near the mills, the cost of raw materials may vary between 8 cents and 15 cents per barrel of cement. The lower figure named is probably about the lowest attainable with good management and under favorable natural conditions; the higher figure is probably a maximum for fairly careful management of a difficult quarry under eastern labor conditions. When it is necessary to mine the materials, the cost will be somewhat increased. Cement rock has been mined at a cost equivalent to 10 cents per barrel of cement; but this figure is attained under particularly favorable conditions. The cost of mining and transportation may reach from this figure up to 20 cents per barrel.

With regard to wet marls and clays, it is difficult to give even an approximate estimate. It seems probable, however, when the dead weight handled is allowed for, that these soft materials will cost almost as much, delivered at the mill, per barrel of finished cement, as the hard dry limestones and shales.

*22d Ann. Rep. U. S. Geol. Survey, pt 3, p. 657.

THE BACK FILLING OF TRENCHES.

By W. F. Raymond, Indianapolis, Ind.

There is no work connected with public improvements that has a more important bearing on the durability of pavements than the back-filling of trenches, and it is surprising how few men understand the proper way of re-filling a trench. There are, of course, many soils to cope with, but each must be treated on the same general principle, i. e., to fill all the voids, that in every case all the particles may be as close together and as tightly compacted as possible.

Let us suppose the case of an eight-foot trench, in which a twelve-inch sewer pipe has just been laid, the soil being all gravel. In the first place the pipe should be well bedded on the sides, the filling material used here should be the finest available and thoroughly tamped with railroad tie tampers, or those of similar structure of iron. Then cover over the pipe about six inches and turn on the hose or wet by pail. Great care must be exercised with the water and no more should be used under any circumstances than will seep away, aided, however, by the use of bars to make holes through the filling, going down to the trench's grade on each side of the pipe. Again put in some six or eight inches of filling and again put on all the water it will take. Then put on three or four inches of loose, dry material and have some eighteen or twenty men with iron tampers line up in the trench and hit hard, the first two tamping along the walls of the trench, the others following, with orders to vary their courses. Three or four men shoveling into a trench are enough to keep the number of tampers mentioned going, but the stretches back-filled at one time should not exceed two hundred feet.

This operation of filling in six or eight inches of material with good use of water, followed by three or four inches of fine dry material with heavy tamping, should be repeated until within three or four inches of the street grade, where after a thorough tamping—the filling already in the trench having been well moistened, not soaked—some coarse material is spread over it followed by fine material heaped up about four or five inches above the street grade. The last should be raked, pulling the coarser material under all the time. After crowning up a heavy tamping should follow and the edges should be cleaned, after which all should be sprinkled. No trench so filled will be found to sink or settle below grade, and the cost will be found to be less than usual, all things considered, provided the force is well organized and well handled. After a week or ten days a heavy roller will put the trench to grade (level) and it will hold forever.

With ordinary earth (loam) filling the process of back-filling will be identical, but usually the surface course will be of stone or gravel as found in the street. In such cases the raking for this last course will be very important and must be done with great care.

With clay quite a different proposition confronts us. If the clay be dry it should be bedded round the pipe, conduit or arch just as designated for gravel. Then should come a covering of the pipe and the tampers should be put to work, the clay having first been leveled in the trench. After thoroughly tamping, the water should be copiously used, but not in sufficient quantity to cause "sponginess." After the first wetting another course of clay of eight or ten inches, then tampers, then water and so on until the trench is filled to within four or five inches of the top. Here a heavy wetting is given and the bars are used to make holes to allow the water to permeate thoroughly through the new back-fill. The top course should be done in the same manner as described for gravel, though if naught but clay is at hand use only the finest, tamp it thoroughly and do not wet save for a light sprinkling to bond the material together.

The clay, if heavy, should never be puddled (a term used to designate a heavy soaking with water) for the reason that the water will go rapidly to the bottom of the trench and is sure to cause spongy, soggy places. Whenever or wherever the condition of sponginess is found, especially in a trench through a street which is to be immediately improved, the entire mass of spongy material should be removed and good, clean gravel or broken stone used in its stead and thoroughly rammed in courses.

In all cases where the soil is mixed, say, gravel, clay and sand, or sand and loam and clay, the finest and driest loam should be put first in the trench, round the pipe and wet, the clay should come

second in all cases, then the sand. Or if gravel is found in the combination of material start and finish with gravel. In case sand and not gravel is found, after the sand has been put on the clay a good wetting and plenty of bar work will fill all voids, then in the last few inches a mixture of the finest clay and sand, moistened a little, will afford a good wearing surface for such material.

Good judgment must at all times be exercised in separating the various kinds of material which come out of a trench while excavating. Great care must also be exercised in putting the material back in proper sequence, that the most compact fill may be obtained for the least labor and cost.

Many will contend that the tampers are unnecessary and expensive and that water and plenty of it will do more than can be accomplished by forty tampers per one thousand feet of trench. To all such the assertion is made that with a force of forty men not less than one-quarter of a mile of trench a day should be back-filled, and done in such a way as will preclude all possibility of settling or sinking, conditions adding to "after-cost" and maintenance.

Wherever stone are found they must be used far enough up in the trench to avoid any chance of damaging pipe, conduit or arch. Fine material must cover the stone and such fine material must be well watered and worked with the bars. The bar work is far more important than it seems and must be well done for successful non-settling back fills.

Whenever back-filling material has become thoroughly soaked by rains, special care must be taken to have coarse and fine material mixed while being shoveled into the trench, as the voids are thus best filled under such conditions. The chief compression in these cases comes from the tampers, and to avoid "picking up" (sticking) a little gravel or sand is used to good advantage under the tampers. In back-filling a trench where naught but wet clay is found, perhaps the most difficult back-filling proposition is encountered. Too much water will surely cause sponginess, too little will leave many voids and the trench must needs settle, so what is the best course to pursue? Fill in with the clay a few inches only at a time, cut it down with shovels or spades, have it thoroughly tamped and repeat until filled, after which a judicious amount of water with bar work, the top course if possible being delayed for a day or two.

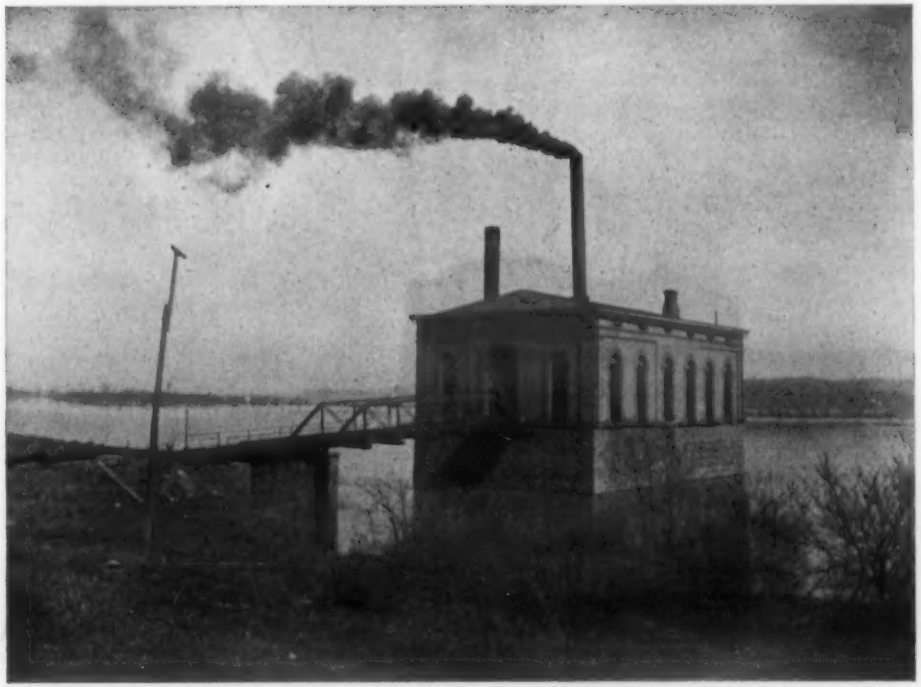
When return buckets are used in trench work no system of back-filling is more satisfactory and efficient than leveling the material a little and applying water through a hose, with good use of bars added; in this case, also, the last three or four inches should be treated as described for loam or gravel. In all very wide deep trenches where sheathing is used no system can be employed which will prove more satisfactory than thoroughly wetting and tamping, using as much fine filling as is possible to find, but the point cannot be too strongly emphasized that too much water is worse than none, so a clever man of good judgment should be chosen to officiate with the hydrant and hose

The writer has seen many miles of trench over a conduit, through all kinds of digging, rock, loam, clay, sand and gravel, which have been back-filled as described above, and not one foot ever settled an inch below the street grade, save some three hundred feet, which was filled with lumpy frozen loam in zero weather. Back-filling is much neglected and far too carelessly done in almost all cities and towns; as a consequence many low spots and depressed, defective pavements are found in streets.

THE WATER-WORKS OF NEWPORT, KY.

Newport, Ky., is a city of nearly 30,000 population, on the Ohio river opposite Cincinnati. Its water supply is drawn by pumping from the Ohio river, the pumping station during a high stage of the river being shown in one of the accompanying photographs. It contains two 4,000,000-gallon Holly pumps and an old pump almost out of commission. A 20-inch force main carries the water to the reservoir shown in another photograph, which has a capacity of 65,000,000 gallons and is located about 330 feet above the pumps. The fountain through which the water is pumped is shown in two of the accompanying views.

The thirtieth annual report of the water department for 1902 is the first under the present management and is made under difficulties, the former officers having resigned without making reports for the year 1901. The works have cost over $1,250,000 and $675,000 in bonds are still outstanding. The sinking fund for taking up



PUMPING STATION. NEWPORN, KY., WATER-WORKS.

these bonds was augmented $31,700 in 1902 from the profits of the operation of the works. Interest on the bonds does not seem to be a charge on the water revenues and is probably paid by the city, though the report is silent upon this point. It amounted to $25,879.50 in 1902, but will be over $3,000 a year less hereafter on account of refunding a large part of the bonds at a lower rate of interest.

The total receipts of the water office were $58,959.96, of which $34,000 were from flat rates and $19,000 from meter rates. The works are owned by the city and no charges are made to other city departments for water used. The report does not state the number of hydrants in use, but it is probably more than 200. Assuming this number, the interest on bonds paid by the city is equivalent to a hydrant rental of $130 each. On the same basis of computation the equivalent hydrant rental in 1895 was not less than $280, but it will decrease from year to year by the operation of the sinking fund so long as additions are not made to the bonded debt.

The total number of water services is not stated in the report, but from other sources the number is estimated at 5,000. Of these 742 are metered, the number having increased nearly three-fold in the last four years. It is evident from the statement of receipts that the largest consumers have had their services metered. The minimum flat rate is $5 and the minimum meter rate is $6 a year.

The expenditures for 1902 were $17,600 for operation, $3,200 for maintenance and repairs, $5,500 for new construction including meters, a total of $26,351.74. Fuel cost $4,000, taxes $3,200, salaries $8,500.

The pumps ran 12.01 days a month, average time, and pumped a total of 648,973,000 gallons against an average head of 332.28 feet.

The details of receipts and expenditures and of operation are given in the report, but are not combined in any form approaching that adopted for uniform reports. Except for errors in assignment of items in classes, the standard form can be filled in by any one from the data given, so far as the annual operations are concerned. Some totals, such as those mentioned above, total cost of works, length of mains, etc., are omitted.

The superintendent has found great waste of water in flush tanks, some discharging as often as twice an hour, and has reduced this by putting in a controlling cock and a disc with a hole three-sixty-fourths inch in diameter on the end of the fixture inside the flush tank. There is also much waste in public buildings. It is proposed to meter them all so that the waste can better be controlled. Electrolysis in service pipes has cost the department over $100 during the year. Water meters seem to be owned by the consumers, and worn out meters are replaced by them when the department requires.

W. L. Glazier, formerly the superintendent of public works and city engineer, has been the superintendent of the water works since March, 1902. He has accomplished some needed improvements and has others in progress.

RESERVOIR. NEWPORT, KY., WATER-WORKS.

EDITORIAL COMMENT

Coming Conventions of Municipal Officials.

George S. Morison.

Methods of Filling Trenches.

Efficiency in Municipal Management.

COMING CONVENTIONS OF MUNICIPAL OFFICIALS.

The League of American Municipalities will hold its seventh annual convention at Baltimore Oct. 7, 8 and 9 and the American Society of Municipal Improvements will meet in Indianapolis Oct. 20, 21 and 22.

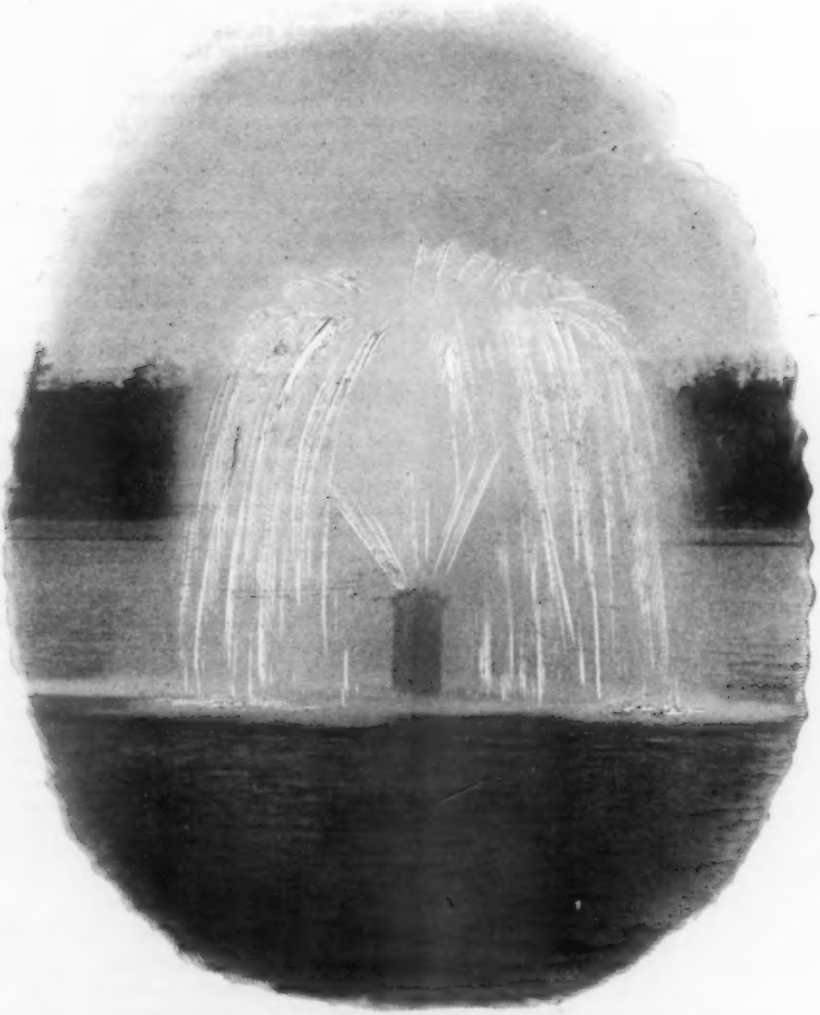
The preliminary program of the former meeting on another page gives a good idea of the subjects under discussion. Each subject seems to be in the hands of a man who has paid much attention to it and the papers should serve as excellent leaders for debate. Nashville is actually constructing some of its public works rather than letting them by contract. Kansas City has recently purchased its water works and has evidently used the knowledge obtained from the discussion of the relative advantages of municipal and private ownership to secure more liberal terms in new contracts with the street railway and electric light companies. Winnipeg has operated a municipal asphalt paving plant for several years, as has been described in this magazine in vol. xx, p. 358, and vol. xxii, pp. 144 and 176. Hartford, Conn., elected a mayor from the labor organizations of the city. The mayors of these cities are on the program with papers upon the subjects with which they thus are most familiar. Other subjects are treated by men having special opportunities for study in their particular lines, thus promising a program more than usually interesting and profitable.

The predominance of mayors in the list of officers and upon the program indicates that the society is made up of men who consider the problems of municipal administration in their larger relations. The titles of the papers show a marked tendency to treat such problems as are subjects of discussion in political campaigns which have live public questions as their issues, and the selection of the men on the program for their respective qualifications and experience seems to be particularly happy.

The program of the American Society of Municipal Improvements is not yet announced, but so far as information has been received it will be fully equal to those of previous conventions. The devotion of one or two sessions to the local engineering problems and their solution at Rochester was so successful a feature of the last convention that it will be continued this year. The city of Indianapolis has set the example on some materials and methods of construction, and has much excellent work to show in the line of public improvements and public service as well as some which is less satisfactory, and it will all be explained by those familiar with the plans and the details. Some of the committee reports will be of special interest and the president promises some good papers.

The list of officers and the names appearing on the programs of the conventions of this organization show that the membership is largely drawn from those directly interested in the supervision and construction of public works. In the large cities these are the members of the various boards of public works, water, light, park and sewerage commissioners, city engineers and department heads, and in smaller cities the members of council committees and mayors, superintendents of water works, lighting plants, etc.

It is evident that the two societies are working upon lines which are approximately parallel and that there is ample room for both. Many will be interested in both societies, in the one for its careful and expert attention to detail, in the other for its consideration of municipal questions in their bearings upon each other and in their relations to public opinion. A mayor, for example, who, like the head of any other business corporation, wishes to know the departments of his establishment, will attend the one society to learn what the department heads of other cities are doing and will bring his own department heads to profit by the technical discussions which there find place. He will go to the other convention with his councilmen and more nearly political appointees to gain the larger knowledge which comes from free discussion of large public questions, led



RESERVOIR FOUNTAIN. NEWPORT, KY., WATER-WORKS.

by those who make them their respective specialties.

The meeting places are not very close together, but the times set for the conventions will enable many to attend them both with little extra expense. The proposed joint meeting of such societies as these would make it easy for men to attend the sessions in both in which they are interested, and would help swell the membership of both. It is equally evident that the lines of subjects and the methods of treating common subjects are so different that a combination of the two societies into one would not be possible were it ever suggested. Perhaps the tendency to hold conventions in St. Louis in 1904 will make it possible to hold the conventions of these two and other societies of a similar nature at the same time or on consecutive days, that the effect of such an experiment may be judged without prejudice.

GEORGE S. MORISON.

In the death of Mr. George S. Morison the engineering profession has lost one of its most prominent members at the age of sixty, when he should still be capable of doing his best work. He was president of the American Society of Civil Engineers in 1895. His most noted work has been in the design and construction of large bridges, five over the Mississippi and ten over the Missouri, being in the list, as well as many others. He has also been engaged in railway work both as engineer and director, and has acted on national boards on Hudson river bridge, New York docks and Southern California harbors. Since 1897 he has been a member of the Isthmian Canal commission, where his services have been of great value.

Mr. Morison is an example of the born engineer. Like his partner for a time, Mr. E. L. Corthell, he received the good old classical education, graduating at Harvard in 1863, and did not enter the engineering field until 1867 at the age of twenty-four. Next to his natural engineering and business ability his thoroughness in detail is doubtless responsible for his success. He could verify every detail of the work of his assistants if necessary and could at the same time readily see their combinations into a great structure. The two men have been examples of the value of the classical training for any profession and have expressed their indebtedness to it.

There was little engineering instruction deserving the name in their college days, and Mr. Morison seems to have had no special intention of becoming an engineer for some time after graduation. The combination of engineering ability and thoroughness with the college training in the use of his faculties to the best advantage made an engineer of the first rank and little more, possibly less, could have been accomplished if he had spent his college time in such engineering schools as were then available. Mr Morison and his associates made many of the most pronounced advances in bridge and railroad engineering practice and may be said to be largely responsible for the present high position of American bridge engineering.

Times have changed and the sum of engineering knowledge has been vastly increased by them and by many more engineers of all grades of ability. As a consequence a well-equipped engineer needs, in addition to the mental training, which is the primary purpose of his college course, as full a knowledge as possible of the prior achievements of his chosen profession, and this now adds so greatly to his labors that the average man must even restrict himself to a special branch. Most of the directors of college and technical school work recognize the necessity of the academic training as well as of knowledge of the field and make as much provision for it in pure culture studies both in and outside the direct line of the students' after work as is possible in the existing state of opinion.

There is a high place in the engineering profession for the classical graduate in the engineering profession, but, to make an equal start with Morrison and Corthell and others of their day, he must spend some additional years in learning the history of his profession, either in college or in the longer school of experience before he can hope to make as notable additions to this history as they have.

METHODS OF FILLING TRENCHES.

The attention of our readers is called to the article by Mr. W. F. Raymond on the subject of the back-filling of trenches, which appears elsewhere in this number of Municipal Engineering. Many city engineers pass this subject with very little attention because it is difficult to secure good work from contractors and the results of bad work usually affect other persons than those who made the trenches. It is responsible for more waste of money and relaying of pavements than is saved in neglecting proper precautions, many times over. Plumbers'

cuts and those of gas and water companies are even more troublesome, because more frequent than those of sewer and pipe-laying contractors.

Mr. Raymond states the results of his experience and would have us believe that a well-organized gang can put trenches back in good condition safe against further settlement at a price even less than that often paid for slovenly work done without proper system. Some of our readers will perhaps not agree that the methods he describes are the best. If so, we shall hope to hear from them. This subject has not had the full discussion by practical workers which its importance deserves, and Mr. Raymond's article is a good introduction, which may well be followed by reports from other supervisors of this class of work giving descriptions of the methods resulting from their experience.

EFFICIENCY IN MUNICIPAL MANAGEMENT.

A standard argument against municipal ownership and operation of public service industries is the inefficiency of the management of municipal affairs under our present system of choosing officials. That there is great extravagance and little expert knowledge in the conduct of municipal business cannot be denied. The occasional instances of the results of good management but emphasize the general deficiencies. As a consequence public ownership is greatly restricted in this country and seldom extends further down the line than the water works system, which has a maximum of public value as compared with private interest and at the same time offers small opportunity for political patronage or manipulation in the actual physical operation of the system.

Municipal ownership extends much farther in England. It goes so far in some directions that the stock phrase designating it is "municipal trading." With very few exceptions the reports of the results of this method of conducting such business as is largely public in its nature are very favorable, the results comparing advantageously with those from private ownership, in reduction of rates and taxes and in economy and efficiency of financial and physical management. The question often arises as to why results are so much more favorable and public opinion extends the operation of the principle so much farther in English cities than in those of America.

The reason is not far to seek, at least in the larger cities. It is found in such an item as the following and the explanation of the method in which such officials secure and retain their positions:

Sir James Marwick retires from the town clerkship of Glasgow after a thirty years' service on a pension of $12,500 a year. His salary was $17,500, making the office he held the best paid municipal post in Great Britain.

The administration of public affairs is made a profession in European countries and men prepare themselves for filling the positions of city clerk, city engineer, burgess or mayor, as they would for the law or medicine. Beginning in subordinate positions, they have opportunities on the death or resignation of officials holding similar positions of advancement in position or salary. Thus a sub-clerk in a large city may become an assistant in a smaller city, may then be promoted to the control of the department in that or another city and then continue his advancement by transfer from smaller to larger cities, or by appointment to higher departments for which his training and experience fit him. The system is extended even to the office of burgess or mayor in many cases. It is readily seen that this system of rewarding efficient service keeps a man up to his best work all the time and the permanence of his official life during good behavior is a strong incentive to young men to prepare themselves for the best possible service.

The system is not applied so strictly nor so thoroughly in England as it is on the continent, but it is very generally followed in the larger cities and in many smaller ones for offices requiring technical knowledge or long experience. The clerk or engineer of a large city has probably attained his position after several steps upward through subordinate positions in smaller cities, each obtained through examination, often similar to those in the civil service in this country, to determine his qualifications as compared with those of other candidates believing themselves prepared for the office, both from the city departments and from other cities. Managers of public service industries are selected in like manner. The consequence is, that, a few political hot-beds excepted, the managers of these plants are even more efficient than those of private plants, where the claims of relationship or friendship are likely to have too much influence.

There are some ideas in the minds of the American public which make the adoption of such a system impossible at

this time, but they are weakening in their hold, and the increasing demand for economy in municipal operation will ultimately require the adoption of an equivalent or better system. When cities and states were new each man assumed that he knew as much about government as his neighbor, and he was not far wrong. This idea is still strong, and in the smaller cities and towns election to office is often all that is necessary to make a man a statesman. Another idea, closely related, is that the city certainly has within its limits men capable of doing all the work required—the city needs nothing which it cannot do for itself. Importation of men from other cities to fill important positions is a political mistake which requires much explanation if it is not actually fatal to future aspirations. Still another related idea is that of rotation in office. If one man is as good as another, each should have his turn at the helm.

The resulting independence of action has resulted in methods of doing city business which are individual to each city. They are good, bad and indifferent, as the establishers and developers of the systems were competent or incompetent for their tasks, and are uniform only so far as the system in one city has been taken as the model for another, but even then subjected to many modifications.

The larger cities have recognized the necessity of special preparation for many municipal duties, and some of them have provided for some measure of permanence in office. It is not usually necessary for such cities to go outside for expert employes. But the principle of rotation in office is still applied to too many positions. The smaller the city, with few exceptions, the nearer the approach to the primitive conditions described. There are evidences of a slow change of opinion which, aided by the growing necessity for economy, promise ultimate improvement. The present agitation for uniformity in municipal accounts and reports is an effort to remove one of the obstacles to the application of the system of transfer of officials from one city to another, which is the basis of efficient management of details in the smaller cities.

THE QUESTION DEPARTMENT

INFORMATION ABOUT CEMENT CONSTRUCTION.

Kindly let me know where I can get the best work on the subject of cement construction, especially concrete sidewalks.

FRANK P. GRAY,
Sidewalk Inspector, Little Rock, Ark.

The "Directory of American Cement Industries and Handbook for Cement Users" ($5) is the best book giving instruction on the subject of cement work. It gives several standard specifications for cement walks and full details of all steps from the testing of the cement to the finishing of the walks. It is difficult to select numbers of Municipal Engineering Magazine of special value on this subject, for every one contains valuable instruction upon the details of cement and concrete work and cement sidewalks, but two articles in particular will be of value to one in the position of our correspondent. They are by F. H. Crafts, C. E., one on "How to Lay Portland Cement Flagstone Walks," in vol. xxiii, p. 242, and one on "How to Lay Portland Cement Steps, Curbs and Similar Structures," in vol. xxiii, p. 430.

PATENTS ON COMBINED CEMENT CURB AND GUTTER.

Will you please inform me whether a combination curb and gutter of rectangular cross section with rounded corner of curb and intersection of curb with gutter is covered by any patents? In other words, am I infringing on any one's legal rights by building this style of curb?

B. E. BRIGGS,
City Engineer, Erie, Pa.

A simple combined curb and gutter of infringement of any patent with which cement concrete, using ordinary materials and methods of construction, is not an the writer is acquainted. Possibly the custom of some contractors of laying the

curb and gutter in alternate sections is an infringement of some patent, but if so the date of the patent and its provisions are unknown in this office. There are patents on special forms of cross-section reinforcing the weak spots, such as the Parkhurst, and on steel reinforcing and corners, such as the Wainwright.

CEMENT FACTORIES ON THE PACIFIC COAST.

I understand there are now in course of construction some cement works on the Pacific coast and that but one is in operation. I wish to know the location of works and who has charge of the management of the same. J. ——, Tex.

The cement works on the Pacific slope which have been in operation for some years are the California Portland Cement Company of Colton, Cal, Frank H. Jackson, director and sales agent, Los Angeles, Cal., and the Portland Cement Company of Utah, of Salt Lake City, Utah. T. C. Cairns, director and general manager.

New works which are now in operation, or will be shortly, are those of the Pacific Portland Cement Company, Claus Spreckles building, San Francisco, Cal.; Samuel McMurtrie, secretary, with works at Suisun; Pacific Portland Cement Company, Rookery building, Spokane, Wash., W. T. Dowsing, secretary and treasurer, with works at Portland, Wash.

Projects which have not yet developed to the point of beginning manufacture are the California Cement and Lime Company, 328 Montgomery-st., San Francisco, Cal., T. C. Lewis, secretary; Great Western Cement Company, E. B. Crane, president, 64 Federal-st., Boston, Mass.; Pacific Coast Portland Cement Company, 66 Broadway, New York.

Information about these companies and about several other projects which are still in very indefinite form will be found in the "Directory of American Cement Industries and Hand-Book for Cement Users" ($5). The scarcity of good cement materials on the Pacific coast and the low freight rates on foreign cement, which is used for ballast on vessels returning to the coast for loads, have discouraged the promotion of cement projects which are so numerous in some sections of the country.

CAUSE OF STREAKS IN CEMENT WALK.

H. H. Hayden of Sulphur, I. T., makes a contribution to the discussion of the cause of streaks in cement walks, which, while not fitting the case referred to exactly, contains some statements of experience which are valuable. He says:

"I notice in the June number of Municipal Engineering (p. 434) that J. F. G. asks for information as to cause of seams or apparent cracks in the finish coat of cement walks. It is my belief that the streaks or seams that he speaks of are cracks which have not yet developed in the surface but will in time. This is based on my experience and observation. I had the same trouble when the material had to be used dry and cracks have invariably developed on the surface in 12 to 18 months and sometimes sooner. My idea is that the streaks are in fact cracks at the base of the finish coat, caused by the more rapid setting when applied on a dry set base. In putting in walks I always slush the base or concrete and follow closely with the finish before the base begins to set, or if it does set I water it before laying the finish coat and now I never see the cracks or seams."

The editor would call special attention to the necessity of laying the finish coat before the concrete base has set. While cracks may not always occur from failure to follow this rule, the top may separate at least in part from the base and finally break up. Neither is likely to happen in a well laid walk with base and top in one solid mass as is possible only when laid so that they set together.

We now have two suggestions as to the cause of J. F. G.'s trouble, based on quite different conditions and others will be published if they are sent to us for that purpose. The information about the trouble is not definite enough to determine which suggestion is nearest the circumstances of the case.

MATERIALS USED IN MAKING CEMENT.

I would like to know if I have the material for manufacturing cement here. If you can furnish me any information on the material used and how it is manufactured, I will be glad to have it.
W. F. C., ——, Va.

The "Directory of American Cement Industries and Hand-Book for Cement Users," ($5) is the best source of information on the materials and methods used in this country in making cement. Besides the general descriptions of materials and methods in the Hand-Book there are the descriptions of various factories, which give all the various combinations of materials used in making cements. Whether any given material is suitable for making cement is a question for the

expert cement chemist, names of which will be found in the Directory.

Municipal Engineering Magazine is also a valuable source of information in this line. The series of articles on materials and methods of making Portland cement which began in the May number (1903) will be a most valuable contribution to the literature on this subject. The "Business Directory" will be of assistance in selecting experts with whom to consult regarding chemical analyses and tests of materials.

STREET MONUMENTS OF CONCRETE.

A subscriber in Oakland, California, makes the following report of the method of setting concrete steel monuments in that city:

"In regard to street monuments of concrete in your issue of June, 1903, I beg leave to write that in the city of Oakland, Cal., there are some fifty such monuments constructed in the following manner: After taking proper offsets to the point to be monumented a hole was bored with an ordinary six-inch post auger about three feet deep. As the hole was being bored it was followed down with a piece of light sheet iron pipe in the same manner as well casing, until the top of said casing was about four inches below the surface of the roadway. This casing was then filled with concrete (1:2:4) to within about three inches of its top, the remaining three inches having a mixture of one of cement to two of sand, in which was placed, while still soft, a ¼ inch brass rod, by remeasuring from said offset points. These monuments are placed in the traveled roadway and covered with an ordinary lamp-hole casting."

FOUNDATION FOR ENGINE.

1. I want to build a base for a 15-horse power gasoline engine to be 2 by 5 feet on top. It must be set on a floor six feet above the cellar bottom. What I want to know is, can it be safely built of cobble stone and lime? If not would cobble stone laid with natural cement (Akron) do, or would it be advisable to build it of concrete with cobble stone embedded therein? There are plenty of cobble stones, sand and gravel, but I would have to draw quarry stone eight miles and pay a good price for it.

2. A man here wants to build a concrete kiln to evaporate apples and berries. It will be in two sections, 20 feet square and 16 feet high, with sheet steel roof. How heavy a wall would be necessary, and could it be built of natural cement?

T. H. N., Lyndonville, N. Y.

1. Will the load of the foundation and engine not be too heavy for the floor? It would seem necessary to carry the foundation down to the ground if anything more than a plate fastened to the floor is wanted. The pier can be made of concrete composed of, say, 1 part good Portland cement, 2 or 3 parts sand and 2 or 3 parts gravel, using cobble stones to fill in with. The outside surface should be smooth and is best plastered with a Portland cement mortar made, say, 1 part cement to 1½ or 2 parts of sand, put on before the cement in the pier has set. It will probably be necessary to build the pier in a timber mold to be removed after the cement has set. Natural (Akron) cement can be used if of the best quality and the proportion of cement is doubled, but the vibration of the machinery is likely to have a more serious effect upon the pier thus built than upon one in which Portland cement is used. For details of specifications and methods of construction see the "Directory of American Cement Industries and Hand-Book for Cement Users" ($5), pp. 129, 132, 159 and 165.

2. The concrete can be made perfectly satisfactory if proper care is taken to allow for expansion and contraction and good materials and workmanship are insured. It will be necessary to use Portland cement in the construction. Well made concrete is stronger than brick masonry so that a wall the same thickness as that for a kiln built of brick would be safe. It will probably be still cheaper, and safer, when the danger of cracks from expansion and contraction is considered, to build the wall of concrete-steel construction, embedding in the wall steel rods or wire netting according to some of the systems now so rapidly becoming popular in this country.

It requires some experience with this class of concrete construction to secure the best results. Concrete blocks are made for building purposes which can be laid as brick or stone are laid with which the effects of changes in temperature are not so noticeable. With medium or low prices for cement they can compete with ordinary brick.

Where can I get information about cinder concrete?

T. J. WILLIAMS,
Kansas City, Kas.

The "Directory of American Cement Industries and Hand-Book for Cement Users" ($5) has instructions regarding the practical use of clean cinders in making concrete and the uses for which it is adapted. Reference should be made par-

ticularly to pages 121, 122, 138 and 220. In Municipal Engineering Magazine will also be found some consideration of the subject, particularly in vol. xxiv, p. 280, where the limitations of its use are discussed, and on p. 15 of the same volume, where it is shown by results of tests that cinder concrete will not carry as heavy a load as concrete gravel or broken stone.

INVERTED SIPHONS FOR SEWAGE.

Will you in your question department kindly inform me of the instances where inverted siphons of considerable length, 300 feet or more, have been used to carry sewage under bodies of water; also where technical descriptions of any or all of the same can be found? What head or velocity of flow, form of inlet and outlet ought to govern the design?

C. N. K., Janesville, Wis.

Folwell's "Sewerage" ($3), gives quite a full discussion of the principles of the inverted siphon for carrying sewage under river beds or similar depressions. He gives one design for such a structure. Wood's "Practical Sanitary Engineering" ($2.50), also devotes some attention to the subject and gives an illustration of one design. In Municipal Engineering Magazine, vol. vi, p. 154, will be found a short description and full drawings of an inverted siphon in use in Roanoke, Va. There are two such siphons in the outlet lines of the Boston sewerage system, each five feet or more in diameter, and one, of special construction on account of local difficulties, in Buenos Aires. In irrigation lines the inverted siphon is frequently used.

The siphon should be smaller than the sewer above it, since it will always flow full. It is common to use two pipes, one of proper size to carry the minimum flow at good velocity and the other to take the additional flow coming at times. The Roanoke siphon has the inlet to this second pipe above that for the first so that it operates automatically. The pipes need gates and facilities for separating their flow at the lower end that either one can be in use while the other is being cleaned. The manhole at one end must be lower than at the other and the slope in the siphon to this manhole sufficient to give pronounced velocity to the water used in cleaning. Velocity of flow in the regular use of the siphon should be as much above the self-cleaning velocity as possible, that the need for cleaning may be diminished in the siphon and confined as closely as possible to the sump in the bottom of the manhole. No special forms of inlet and outlet are necessary, aside from the manhole, gates and partitions named.

REMOVING ROOTS FROM SEWER PIPE.

Thomas Strouse reports his experience in removing roots from sewer pipe to be added to that which has been related by others in this department in previous numbers of Municipal Engineering Magazine.

"The tools for cleaning consist of a cylinder about twelve inches long, having knife-shaped spikes, or a spiral cutter with swivel ends. This is drawn back and forward from one manhole to the next with a half-inch rope attached to windlasses, until all roots are cut loose. Then if the pipes are thoroughly flushed all roots will be washed out. This will apply to sewers from four to ten inches in diameter. If the proper connection is put in the cellar any kind of rubbish can be removed to the main sewer from the connection with little trouble. I have had very good success with these tools and cellar connections. They are simple and sanitary."

CESS-PIT FOR SCHOOL BUILDINGS.

Can a school building accommodating 400 pupils be successfully and sanitarily sewered into a cess pit? The building is so located that it cannot reach sewers. Please give in your next number the best method of constructing cesspits. The soil is loamy with some clay.

S. C. STALLINGS,
City Engineer, Cordele, Ga.

A water carriage system discharging into a cesspool will not prove satisfactory on the plan suggested in the question. The cesspool may be made in the form of a septic tank if there is an opportunity to discharge the effluent water on the soil in such manner that it will not produce a nuisance, and in that case proper attention will keep the system in good condition and the tank may not require cleaning more than once or twice a year.

Some of the heating and ventilating systems in use in the north add a "dry closet" system, which is simply a fireproof trough, closed except for the holes for seats and at the ends, through which all exhaust air from the rooms is drawn. This air dries the deposits made in the trough, which may be burned at intervals, the air and the products of the combustion passing up a brick stack to a point of discharge above the building. While the combination of the heating and

ventilating system with the closet system has not proved satisfactory at all times, it would seem that an independent dry closet system on the same principle should work satisfactorily, especially if located in a building outside the main school building.

Other less satisfactory methods are pits over which the seats are located, which must be easy of access for cleaning, or pails or light troughs located immediately under the seats, which must be removed and cleaned daily. Neither of these is as satisfactory as the others named, though less expensive in first cost. All require constant attention from careful men to prevent nuisance.

INDIVIDUAL SEPTIC TANK SYSTEM.

Owing to the peculiar situation of our village with two creeks and a canal running through the whole length and the greatest elevation at right angles to these near the center of the town, we have considered it probable that the individual septic tank system may be necessary. Has this system been used and with what success? Population of village is about 2,500. We have read the article by B. J. Ashley, p. 355, November, 1902, number of Municipal Engineering, but have heard intimations that it has not proved to be a success. L. W. M. ——, O

Mr. Ashley's paper described his experience in purifying the sewage from a single house and the design which he based on his experiments. Similar systems, more elaborate in some cases, have been installed for many isolated houses and institutions of larger size, some of which have been very successful, and some entire failures. They all require some attention, the amount depending upon the elaborateness of the design and apparatus used. Mr. Ashley's plan was unique in that he applied the septic tank system to a small house and with a minimum of apparatus, requiring a minimum of attention, and meeting with a fair measure of success.

Mr. Ashley's paper then proposes to apply the method for purifying the sewage from each house in a village. The effluent from the individual septic tanks must, according to his plan, be collected in a system of sewers, not being sufficiently pure at all times to permit discharge into street gutters or open water courses, and it being inconvenient if not impossible to take care of the effluent water on the lot on which the house is located, even if it can be discharged on the surface or into subsoil drains without pumping.

This reduces the question to a comparison of the cost and efficiency of the individual purification plants and of one or more plants at the outlets to treat the raw sewage discharged directly into the sewer system. There is room for difference of opinion here, which has been expressed in the discussion of Mr. Ashley's paper, there being no system in operation which uses the individual septic tanks except special cases.

BOOKS ON MACADAM ROAD BUILDING.

Have you any books that treat on macadam road building, giving description of materials, showing cuts, fills, grading lines, etc., in fact a book for a foreman, showing him how to go to work to grade and get ready to finish?

FRANK WHITCOMB,
Johnstown, N. Y.

The writer knows of no book upon highway construction which has been written with special reference to the needs of the construction foreman but believes that Baker's "Roads and Pavements" ($5) comes nearest filling his needs of any of the books published. The chapters on earth, gravel and broken stone roads all contain valuable information for such a man and if he follows the principles of construction developed in them he will secure good work. Nearly 200 pages, one-third of the book, are given to these classes of roads. Byrne's "Highway Construction" ($5) and Tillson's "Street Pavements and Paving Materials" ($4) are also good books but do not seem to meet the call of our correspondent so well as Baker.

WEAR AND QUALITY OF ASPHALT STREETS.

I understand there is a paper published in your building pertaining to improved asphalt streets. If so, will you kindly refer this letter to them, as I am desirous of getting some information as to the wear and quality of asphalt streets. CHAS. E. HURLBERT,
Freeport, Ill.

There is no paper of this nature published here. Possibly the misunderstanding arises from the fact that the name of this magazine at the start was "Paving," being changed later to "Paving and Municipal Engineering" and still later to its present title. The volumes of the magazine under all three names contain the fullest information obtainable upon the subject of the wear and quality of asphalt streets. In addition to the list of articles on special features given in vol. xxiv, pp. 275 and 361, the following, which have appeared in the last four or five years, may be named as a few ex-

amples of the treatment given to the subject of asphalt streets as regards their quality and wear:

"The Principles Upon Which the Choice of a Street Pavement Depend," vol xxiv, p. 270; "Cost and Durability of Asphalt Pavements," vol. xxiii, p. 100; "Maintenance of Asphalt Streets," vol. xxiii, p. 10; "Asphalt for Southern Cities," vol. xxi, p. 156; "Repairs of Asphalt Pavements in Buffalo," vol. xxi, p. 97; "Cost of Asphalt Pavements," vol. xx, pp. 132 and 146; "Failures in Asphalt Pavements and Their Causes," vol. xviii, pp. 18 and 319; "Asphalt Paving Tests," vol. xviii, p. 291; "Physical Properties of Asphalt and Asphalt Cements," vol. xvii, p. 282; "Cost of Asphalt Repairs," vol. xvii, p. 14; "Data on Asphalt Pavements in America," vol. xvi, p. 297; "Making Asphalt Blocks," vol. xvi, p. 259; "Asphalt Statistics," vol. xvi, p. 173.

The subject of asphalt as a paving material is so important that every number of the magazine has articles upon it. Information as to what back numbers can be supplied will be given on application.

BRICK AND MACADAM PAVEMENTS.

I am seeking information in regard to brick and macadam pavements. I want to know something about the cost per square yard, how it should be laid and what are the best brick. To what literature on the subject can you refer me in your back numbers or elsewhere?

E. C. P. ——, Ala.

The volumes of Municipal Engineering Magazine are the best sources of information on these subjects. Every number contains something. A few of the more important articles appearing in the last two or three years are listed:

In the current volume, xxv, on the cost on brick paving, p. 45; on bituminous macadam, pp. 27, 28, giving also a list of articles on this subject in recent numbers.

In vol xxiv, on foundation for brick pavement, p. 360; specifcations and instructions for laying brick pavements, p. 35; filler for brick pavemnts, p. 17; principles on which the choice of a pavement depend, p. 270; brick as a paving material, p. 338; on macadam road construction, p. 197; specifications for telford construction, p. 432.

In vol. xxiii, on some paving problems of a small city, p. 8; prices of paving materials, p. 446; popularity of brick paving, p. 257.

In vol xxii, methods of testing brick, p. 39; how to lay brick paving, p. 88, with lists of prior articles, also on p. 251; comparisons of brick tests and street wear, pp. 284 and 363.

In vol. xxi, on requirements of paving brick, p. 31; filler for brick pavements, p. 81; expansion of brick pavement, p. 78, with list of prior articles; cost of macadam pavements, p. 159, with list of prior articles on the construction and cost of macadam pavements.

There are many more. Baker's "Roads and Pavements" ($5), is an excellent book, especially on brick and macadam pavements.

COST OF ELECTRIC STREET RAILWAYS.

Where can I get an idea of the cost of constructing the road bed and putting down the rails or the cost per mile for complete installation of an electric railway, the first item more particularly?

S. S. INGMAN,
Georgetown, S. C.

Foster's "Electrical Engineers' Pocketbook" ($5) gives the details of the force necessary for track laying, and a list of the tools necessary. The materials needed, ties, rails, joints, spikes, etc., are also stated, so that, with the local cost per unit of measurement of the materials and of labor, a close estimate of the cost can be made. Similar data are given for all parts of the construction of an electric railway system, including repairing of street. Brooks's "Hand-Book of Street Railway Location" ($1.50) gives two or three examples of estimates of cost of the ground work of a street railway in some detail and of the overhead work with less care.

ELECTRIC LIGHTING CONTRACT PROVISIONS.

We are entering upon the discussion of a new electric lighting contract and among the points are the merits of enclosed vs. arc lamps, terms of contract, etc. I will be very glad if you will refer me to such data as can be obtained on this subject.

A. J. H., ————, Ind.

Reference to the back numbers of Municipal Engineering will bring to view a large amount of data on this subject. For example vol. xv. p. 276, gives some statistics of cost; vol. xvi, p. 384, a schedule of charges; vol. xxiii, p. 20, a detailed statement of desirable provisions for an electric light contract. In vol. xxiii, p. 175, will be found a list of prior articles on the cost of electric light and rates charged. The open and inclosed arc lights are compared in vol. xvii, p. 65; vol. xxi, p. 210; vol. xxiii, p. 364; vol. xxiv, p. 6.

Many other articles may be found upon all phases of the subject. Crocker's "Electric Lighting," vol. ii; "Distributing System and Lamps" ($3) is a valuable book in this case.

COLLECTION AND TRANSMISSION OF ELECTRIC POWER.

Is it practical to collect the powers from two or more plants several miles apart and transmit said collection as a single accumulated power over one wire to the point of application for electric lighting or other mechanical purposes?

SUBSCRIBER, Kalkaska, Mich

It is possible to collect and transmit power in the manner described. Whether it will be a commercial success is a question which should be submitted to an expert electrical engineer who can study the circumstances of the particular case. There are several such plants in operation, though they have some disadvantages which make them less satisfactory than a single generating station for each system would be.

PAINT FOR BRIDGES—SPECIFICATIONS FOR REPAINTING—WET CEMENT—STEEL MANUFACTURERS' POCKETBOOK.

1. What is regarded as the best paint for southern climate? Mineral and oil seem to dry up and scale off. Are coal tar and asphalt suitable?

2. Can you inform me where I can get specifications for cleaning and repainting steel bridges; also estimate of cost of same per linear foot for both high and low trusses?

3. Will a cement wet through by rain in sacks set properly and reach its maximum hardness and strength?

4. Where can one secure pocketbooks of manufacturers of steel or similar treatises on steel shapes?

OKLAHOMA READER.

The trouble with mineral paints described is due to poor materials, especially oil, or application of paint on rusty or dirty surface, or both, rather than to the climate. A good quality of iron oxide paint mixed with the best quality of linseed oil should give as good results as any paint available. Graphite is increasing in popularity as a paint for iron and steel, and a second coat of asphalt pa nt or varnish is often used, the first coat being of red lead or other mineral paint.

2. The discussion of a paper on the painting of the Louisville and Jeffersonville bridge, in the transactions of the American Society of Civil Engineers gives full consideration to the points in such specifications. The specifications for repainting are the same as those for painting found in such books as Freitag's "Architectural Engineering" ($3.50), Waddell's "De Pontibus" ($3), Johnson's "Engineering Contracts and Specifications" ($3), etc. The specification for cleaning requires that all old paint, rust and scales shall be thoroughly removed, leaving a clean surface. If the sand-blast can be used, it seems to do the best work. If not, steel brushes and scrapers must be used with whisk brooms to remove the dust before applying the paint. The cleaning is a most important part of the process of repainting and sometimes costs as much as the paint and its application. The paper above referred to gives many data regarding cost of repainting, most of them in terms of the cost per ton of steel in the bridge, this being more satisfactory, usually than the cost per linear foot. The Ohio river bridge referred to cost 38 cents a linear foot or 46½ cents per 1,000 pounds for one coat on the approach and span; 82 cents per foot or $1.049 per 1,000 pounds for two coats on the Louisville approach, and less for the long channel spans. The labor cost here is low, being but little more than the cost of paint. In other cases the labor cost is several times the cost of paint. On the R. W. & O. R. R., for example, it was twice the cost, the total being 51½ cents a ton for one coat, including cleaning with wire brushes on plate girders; 72½ cents on trusses and 99¾ cents on a viaduct, the paint being an asphaltum-varnish. Another engineer reports that the first coat of red lead cost 50.3 cents per 1,000 pounds of steel in the bridges and the second 20.7 cents, a total of 71 cents; and that for iron oxide two coats cost 44.6 cents, all for repainting old bridges. One coat of iron oxide on another set of bridges cost 33.7 cents. In those cases the labor was from ½ to 2-3 the total cost. C. E. Fowler prepared some years ago a paint table for bridges from which the following data are taken for highway bridges 16 feet wide, designed to carry 90 pounds per square foot:

Span ft.	Weight of span lbs.	Area to paint sq. ft.	Cost for one coat.		
			Material per 1000 lbs. of bridge.	Labor per 1000 lbs. per coat.	Total cost per 1000 lbs.
20	1800	400	$0.25	$1.39	$1.64
40	5200	800	.15	.82	.97
60	10200	1400	.15	.67	.82
80	16800	2200	.13	.61	.74
100	25000	3000	.12	.58	.70

The table covers other spans and other classes of bridges and the allowance for

labor seems to be large enough to cover cleaning off old paint and rust. All these estimates are approximate and vary with the kind of paint, difficulty of doing the work, location of bridge, etc.

3. Cement wet through by rain in sacks would harden in mass or large lumps and could not be used. The outer portion may harden and protect the inner portion, in which case the cement would not be wet through, and it might be possible to use some of it. If it has become damp enough to form lumps it has lost much of its strength, however, and should not be used. So long as it retains its original fineness it is injured but little if any, but lumps indicate that enough water has entered to cause some setting of the cement and thus to injure it. It is safest to reject entirely any cement which has been exposed to rain or dampness.

4. Of the steel manufacturers, such as Carnegie Steel Co., Pittsburg, Pa.; Pencoyd Bridge and Construction Co., Philadelphia, Pa., etc.

BOOKS ON BRICK KILNS AND MACHINERY.

Kindly give me date and price for any new books on brick kilns and machinery dealing with modern and recent methods.

A. J. STEVENS, Toronto, Ont.

Aside from such books as Dobson's "Brick and Tile Making," ($1.20), Crary's "Sixty Years a Brickmaker, ($2.50), Morrison and Reep's "Brickmakers' Manual." ($3), Davis's "Brick, Tiles, Terra Cotta." ($5), which perhaps do not quite fill the specifications of dealing with the most recent methods, the pages of trade periodicals and trade catalogues devoted to brick and clay are the best sources of information, such for example, as "Brick," ($1 a year), and "The Clayworker," ($2 a year).

INFORMATION ABOUT WATER RATES.

Will you kindly give me references to publications of water rates charged by private companies? D. A. KIMBALL,

Stockbridge, Mass.

In Municipal Engineering Magazine will be found a number of schedules of water rates, more or less complete. The Indianapolis schedule will be found in vol. xxiv, p. 195. The schedules in the larger cities of the United States are given in vol. xvii, p. 264. The meter rates in many cities are given in vol. xiii, p. 132.

The most complete collection of water rates will be found in Baker's "Manual of American Water Works" ($3).

QUALITIES OF BRICK FOR BUILDING.

Which do you regard as the better for foundations, dry-pressed brick or shale brick, made by the wet process, sometimes called mud brick?

Which do you prefer for superstructure when appearance is not an important consideration? A. J. PALM,

Meadville, Pa.

The qualities of the brick which depend upon the materials of which it is made and the thoroughness of burning, are of quite as much importance as the methods of manufacture. "Mud" brick are ordinarily stronger than dry pressed brick (not re-pressed, which are soft mud brick re-pressed after they have partly dried), but the full strength of a brick is not developed in a wall with ordinary mortar. If Portland cement mortar is used, the strength of the brick becomes of importance.

A specification which will secure well-burned brick of good regular form is ordinarily sufficient and the writer would make his choice of bricks offered on the basis of compressive and crossbreaking strength and small absorption rather than on the process of manufacture. The soft mud brick which are well made and burned ordinarily give the best results under these tests, but some dry-pressed brick give exceptionally good results and the choice in any given case should be based on tests of the particular makes of brick offered.

TRUCK FOR MOVING LARGE TREES.

Will you kindly advise us where we can find a cut and description of a truck for moving trees or where we can buy such a truck? We wish to move trees up to seven or eight inches in diameter a short distance only.

J. W. H., Memphis, Tenn.

Park and Cemetery ($1 a year), a monthly magazine in Chicago devoted to landscape gardening, has published illustrations of such trucks. One is manufactured by Isaac Hicks & Son, Westbury Station, N. Y.

MANUFACTURERS OF FLOOR TILE.

Can you direct me to the manufacturers of floor tile for hotel offices, toilet rooms, etc.? C. F., Gallipolis, O.

From the many names of tile makers and dealers in Hendricks' "Commercial

Register" ($6) a few in Ohio are selected: American Encaustic Tiling Co., Zanesville; Mosaic Tile Co., Zanesville; Ohio Tile Co., Hamilton; American Art Tile Co., Columbus; T. A. Rodefer, Bellaire; Diamond Rubber Co., Akron; B. F. Goodrich Co., Akron; Republic Rubber Co., Youngstown.

The first four make encaustic, vitrified and cement tile, the next illuminating tile and the last three rubber tile.

ASPHALT CONTRACTORS ON PACIFIC COAST.

Can you give me the addresses of asphalt paving companies doing business in California and Washington who are not in the asphalt trust? J. K. B.,
East Orange, N. J.

The following are reported to answer the above description: City Street Improvement Company, Flynn and Tracy, of San Francisco, Cal.; Fairchilds, Gilmore, Wilton Co., Bryson Block., C. Scheerer & Co., 121½ W. Third-st., Smith Paving Company, 1543 Council-st., of Los Angeles, Cal.; Mr. Over, San Diego, Cal.; Northwestern Asphalt Paving Company, Seattle, Wash. Additional names are J. J. Dowling & Son, Union Paving and Contracting Company, and the San Francisco Paving Company of San Francisco, and Mr. Harrison of Los Angeles.

AREA IN CITY STREETS.

In your June number (page 418, foot of second column) you raise a question as to my having correctly quoted, on page 315 of my Treatise on Roads and Pavements, statistics from the eleventh U. S. census as to the per cent. of street area to city area. My copy of the original report is at the bindery and hence inaccessible at present, but I have just accidentally come across a copy of said report on page 153 of volume ii of your magazine, and as my data agree with those in your journal it is probable that both quote correctly. As you seem to have personal knowledge that the census report is incorrect, it is hoped that you will investigate the matter further and give your readers the benefit of your conclusions.

IRA O. BAKER,
Champaign, Ill.

The question is not so much the correctness of the quotation as the correctness of the data quoted. The quotations made by Professor Baker in his "Roads and Pavements" and by Paving and Municipal Engineering, vol. ii, p. 153, seem to be from Bulletin No. 100 of the U. S. Census for 1890. There is also a volume of "Social Statistics of Cities" compiled for the same census, the date on the title page being 1895, but the data probably pertaining to the year 1890. The accuracy of the data in these publications is very seriously questioned and the accuracy of Professor Baker's quotation of the data was only doubted in the review of his book because both publications were not at hand at the time and they were so obviously in error, especially in the instances mentioned, that it seemed impossible that they should be made except by oversight in quotation.

To show their inaccuracy the following comparison is made of data from three sources for the city of Indianapolis, taken only because the data for that city for the years 1890 and 1891 are at hand.

Bulletin No. 100 of the 1890 census states that Indianapolis has 400 miles of streets with an average width of 75 feet and that 56.42 per cent. of the area of the city is in the streets. This would make the area of the city about 6,150 acres, and the street area 3,636 acres.

The volume of "Social Statistics of Cities," census of 1890, gives the area of the city as 6,965 acres, the building area 3,751 acres, leaving street and park area 3,214 acres. The street length is given as 288 miles. This would make the percentage of the total area in streets 46 and the width of streets average 92 feet. Park area being but 91 acres within the city limits does not greatly affect the result.

The discrepancies in these two collections of data are great and there are evident errors in both.

The first report of the city engineer under the new charter of the city was made for the year 1891. In this report the mileage of streets is given as 287.82, the same as in the "Statistics of Cities." The area of the city is given as 7,927 acres at the beginning of the year 1891. Few streets in the city are 80 feet wide or more and the average width of the streets is certainly less than 75 feet. In the absence of an authoritative statement we may assume, with Bulletin No. 100, 75 feet as the width of the average street. This gives 2,404 acres of street surface if we allow 8 per cent. for the double measurement of street crossings, or 30 per cent. of the total area of the city. The percentage is still less in 1895, being then nearly 24, on an area of 11,747 acres and a street length of 332.8 miles.

The figures for Binghamton are almost certainly equally in error in the opposite direction.

It would seem to be impossible for a statistician in the least familiar with city conditions to pass such remarkable differences as many appearing in the tables without making inquiry regarding the rea-

Pouring Bitumen on Foundation Coat.
Laying Wearing Surface.
Placing Bitumen Flush Coat.
PROCESS OF LAYING BITULITHIC PAVEMENT.

son for them. Such inquiry would evidently bring to light the errors in the data in many cases. The need of the bureau of statistics which is now being established under the new Department of Commerce with full power to employ experts is clearly shown by the occurrence of such discrepancies and deviations from fact as the above quotations from two publications of the same department, admitedly expert in its particular field, but obviously in poor hands in such special inquiries as this.

MUNICIPAL MATTERS IN COURT

Abstracts from Decisions of the Higher Courts.

Assessments—A statute provides that three-fourths of the cost of paving a city street may be imposed upon property-owners by the front foot rule. Held, not obnoxious to the fourteenth amendment of the federal constitution. Chadwick vs. Kelly, 23 Sup. Ct. Rep. 175.

Assessments—One provision of the Kansas City charter is that when any street improvement, other than grading, is made the cost shall be computed and apportioned among the several lots of land to be charged therewith according to the frontage. It was held that special taxes for street improvements other than grading should be assessed wholly on lots fronting on the street and not divided between such lots and others not so abutting. In the same case it was held that where no objection to the method of assessing certain property was interposed as a defense to the special tax bill a collateral proceeding to quash an execution levy on a judgment based on such special tax bill will be unavailing. Barber Asphalt Paving Company vs. Keene et al 74 S W. Rep. (Mo.) 872

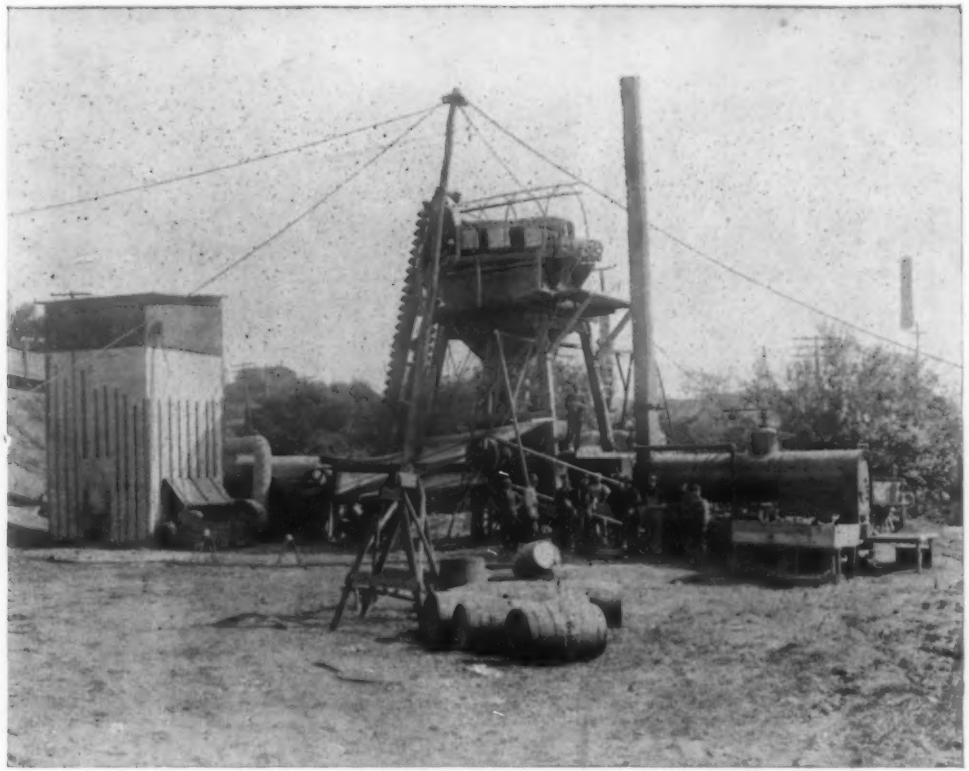
Assessments—Chapter 50, sec. 11, revised statutes of Massachusetts provides that the mayor and aldermen of a city may agree with a land owner that no benefits shall be assessed against noncontiguous land when the city is not compelled to pay damages for land taken for a right of way. Held, that where one of the provisions of such an agreement is that the city shall take care of surface water it is binding, even though the city might have to go on to the land of others to care for such water.

Assessments—Where the salable value of property, if subdivided into building lots running back a depth of 192 feet, is not less than $10 per front foot, a charge for a paving improvement slightly in excess of $5 per front foot does not amount to spoliation. The fact that land within city limits is altogether used for agricultural purposes does not exempt it from assessment for street improvements. The necessity for substituting an asphalt pavement for a macadam turnpike road on the remote outskirts of a city is a matter left to the sound discretion of the municipal authorities, which the courts, except in case of spoliation, cannot review. The statutory lien of a company for street improvement being against the land itself, and not against the owners, if the land is subjected to sale thereunder the lienholder is entitled to have his lien enforced against the entire lot, irrespective of the various interests of life tenants and remainderman therein. Dukes et al. vs. Barber Asphalt Paving Company, 74 S. W. Rep. (Ky.), 744.

Assessments—A railroad company had appropriated for its right-of-way a strip of land, which is a "lot" within the meaning of the statute relating to street improvements. Held, that the railroad must pay the assessment for street improvement. Figg vs. Louisville & Nashville railroad. 75 S. W. Rep. (Ky.) 260.

Assessments—Illinois Improvement Act 1897 (Laws 1897, pp. 104, 105) secs. 7 and 8 requires that when a local improvement is to be made a time must be fixed for a public hearing. Under this act it was held that where one ordinance was passed and a public hearing given, but a subsequent ordinance modified the former one and increased the cost to the property-owners, who were not given a hearing, the court had no jurisdiction to render judgment for assessments taxed for improvements under the latter ordinance. The court having rendered judgment may vacate it at a subsequent term. City of Chicago vs. Walsh et al. 67 N. E. Rep. (Ill.) 774.

Bids—Under the provisions of an ordi-



THE LATEST DESIGN OF BITULITHIC PAVING PLANT, WORCESTER, MASS.

nance a city of the second class had the right to reject all bids, including the lowest, for certain improvements. Trapp vs, City of Newport, 74 S. W. Rep. (Ky.) 1109.

Constitutional Laws—Laws 1901, p. 104, relating to a special assessment, amending local improvement act 1897, sec. 7, held not violation of constitution, Art. 9, sec, 9, requiring uniformity of taxation. Gage vs. City of Chicago, 67 N. E. Rep. (Ill.) 477.

Original Construction—A street improvement held to be an original construction under Kentucky statutes, sec. 3,572. City of Catlettsburg, 74 S. W., Rep. (Ky.) 1.064.

Defects—Damages—Under a contract to construct a sewer for a city, held, that the contractor was not responsible for a defect arising from the improper method of construction directed by the city's engineer. A city's engineer held to have no general authority to modify a contract for construction of a sewer, though a contractor is not responsible for a defect arising from pursuing a method of construction not directed by the engineer. Provision in contract for damages for delay in constructing a city sewer held not waived by the contractor being permitted to complete it, and by estimate being accepted and paid. Under a contract for construction of a sewer for a city, held, that the estimates of the city engineer, if honest, were conclusive. Lamson vs. City of Marshall. 95 N. W., Rp. (Mich.) 78.

Damages—Property-owner, making improvement before establishment of street grade, held, not entitled to damages resulting from bringing street to grade thereafter establishd. Wilbur vs. City of Ft. Dodge, 95 N. W. Rep. (Iowa), 186.

Drains—Plaintiff owned lots through which a natural water course runs. The city turned surface water into this drain. Held that city might do this, providing reasonable skill and care be exercised. Miller et al. vs. city of Newport News, Va., 44 S. E. Rep. (Va.), 712.

Franchise—The city of Helena granted to a water company the right to construct and maintain for twenty years water mains and pipes in and along its streets. The grant contained the proviso that nothing therein contained should be construed to give the company the exclusive right of occupancy of the streets * * * of said city with water mains and pipes, or the exclusive right of conveying and distributing and selling the same throughout the city." It was also provided that said grant should not preclude the city from constructing plants of a public nature.

It was held that a public grant or frannchise is to be strictly construed aginst the grantee and in favor of the what is granted in clear and explicit public and that nothing will pass except terms. Also that in view of the reservation aforesaid it was not an implied condition that the city should not construct water plants of its own. City of Helena vs. Helena Water Works Co., 122 Fed. Rep. 1.

Powers—Where a city has the right under its contract with a water works company to purchase the plant of said company it has no power in the absence of statutory authority to sell the same. De Motte vs. city of Valparaiso. 67 N. E. Rep. (Ind. app.), 465.

Powers—A city having express authority to grade and pave streets, and to hold real estate necessary for its use, has authority to purchase a stone quarry without its corporate limits to obtain raw material from which to manufacture crushed stone. Schneider vs. City of Menasha, 95 N. W. Rep. (Wis.) 94.

Sewers—The charter of the city of Gloversville, N. Y., authorized the city to maintain a sewer system, but it was held that his did not authorize the city to discharge sewage through its sewers into a creek to the injury of the riparian owners. Summons vs. City of Gloversville, 67 N. E. Rep. (N. Y.) 622.

Vacation of Street—Sec. 3,647, I Burns (Ind.), revised statutes, 1901, regulates the manner in which the common council of a city may vacate streets. It provides that if any property-owner immediately on the line of the street who is directly interested shall object, the objection shall be reported to the council and section 3,650 fixes the duty of the council on such report and provides that it shall have no power to order a vacation when objected to by property-owners adjacent thereto.

It was held that the only person competent to object under this section is a property-owner immediately upon the street or the part thereof to be vacated. Hall vs. City of Lebanon et al., 67 N. E. Rep. (Ind.) 703.

SUCCESSFUL PAVING METHODS

Bituminous Pavements—Development of Warren Patents—Perfection of Construction Details—Extent of Use—Organization of Company.

Development of the Bitulithic Pavement.

It has been shown by several articles in this magazine that cements manufactured from the best grades of coal tar have been used in making good pavements for many years. It is also certain that many poor pavements have been made with coal tar as the cementing ingredient. Quite a number of the fittest coal tar pavements laid in Washington in the 70's have survived to the present day; and a recent inspection of them has demonstrated to the writer that good and durable pavements have been and can be laid of coal tar cement and gravel. Their record as to cost of repairs is better than that of asphalt pavements, but many failures have been covered by asphalt repaving. There has been no one interested in maintaining coal tar pavements in good condition for almost thirty years, while some have been interested in reflecting discredit upon their use and enlarging upon failures to a very considerable extent.

The question why one coal tar pavement was good and another poor was not settled in those days and this class of paving was finally discontinued, because success or failure could never be predicted and the change in quality of coal tar with changes in methods of making gas made the failures too nearly certain.

Other articles in this magazine have shown how Mr. F. J. Warren and his associates took up the study of coal tar pavements in a scientific way and finally evolved a cement of uniform quality and a method of combining it with properly selected materials making a good pavement which gives evidence of great durability, and has some other advantages. Crude coal tar varies greatly in its physical qualities and in its purity, and crude tar has never been used successfully in pavements. It is necessary to first make it into a cement of uniform quality. It would be as improper to condemn pavements manufactured from coal tar because certain pavements have failed, as it would be to condemn the use of Portland cement because marl and limestone, which are used in the manufacture of Portland cement, are not a cement in themselves.

In condensed form the statement of his results may be given as follows: The principal defects of bituminous pavements arise from three primary causes: (a) the deterioration of the bituminous material; (b) its use with improperly graded mineral matter and the use of too hard bituminous cement, because with the mineral matter used it had to be made hard enough to take a share of the burden of traffic in order to give stability to the pavement; (c) and lack of uniformity in the preparation of the bituminous material itself. The first two defects may be minimized by the same process, that of reducing the voids in the stone aggregate to a minimum. This makes the surface subjected to the wear of traffic practically solid stone; and the bituminous cement can be softened as it acts simply as a cement. The deterioration of bituminous cements is mainly due to the action of air or water, or both, according to the character of the bituminous material used. It is evident that by this method of construction the amount of bituminous cement exposed to the action of these elements on the surface is the least possible. The use of a slight excess of bituminous cement, careful laying and thorough rolling with heavy rollers make the pavement very dense and impervious to water and air, so that no deterioration from contact with these elements can take place inside the paving composition. Various bituminous materials are affected in various ways. Thus, some asphalts containing considerable proportions of mineral matter or salts are seriously affected by water, especially when in the form of thin coatings over sand grains or stone particles. This may be shown by mixing with sand having, say, 30 per cent. voids, 10 per cent. of such asphalt, and placing a small block of this mixture in water. The destruction of the asphaltic cement by the water will be very noticeable within a few hours. Purer asphalts are less affected by water and with some the effect is hardly noticeable. Coal tar cement in this test is not affected by water. Coal tar and the softer asphalts

C. M. WARREN. H. M. WARREN. JOHN WARREN. S. M. WARREN.

THE OLDER GENERATION OF WARRENS.

are changed by exposure to the air, the lighter oils being evaporated, and the surface unless protected, is hardened and ultimately is made brittle. Both classes of bitumens, therefore, need protection from the elements.

The first patent granted to Mr. Warren, No. 675,430, June 4, 1901, for improvements in pavements or roadways based on these principles, describes the method of reducing the voids in the broken stone layer to a minimum of about 8 to 10 per cent. by mixing given proportions of stone of given sizes from 3 inches down to dust passing a 200 mesh screen and filling the voids to a slight excess with bituminous cement, naming "coal tar, coal tar pitch, asphalt, or a mixture of them or other equivalent bituminous material." The process of combining and laying these materials reduces to a minimum the surface of the cement exposed to the elements. With a well compacted broken stone base over which a junction coat of another grade of cement has been poured this makes a pavement which has demonstrated its excellent qualities, and is proving its durability.

On March 11, 1902, patent No. 695,421 was issued to Mr. Warren for a modification of the process just described, permitting the omission of certain sizes of stone in making the mixture—for example: those between ½ inch and 1-10 inch in diameter, good results being obtained with this mixture. In fact some experimenters have stated that with stone of some forms of cleavage a smaller percentage of voids can be obtained by the omission of the sizes named. On the same day Mr. Warren was granted patent No. 695,422 for the flush coat of bitumen which is now used on all bitulithic pavements. He had observed a fine cellular or honeycombed appearance of the surface of the pavements laid according to the method of the first patent, which necessarily appears after rolling of a surface mixture containing coarse particles of mineral grain. To prevent the consequent action of air or water, thus reaching a comparatively large area of the bituminous cement, a thin coat of adhesive cement is applied hot and is brushed or rubbed into the surface to fill the cells or pores and make the surface dense and impervious. A thin coat of stone screenings, gravel or sand is rolled into this to provide a rough surface. Still another patent of the same date, No. 695,423, specifies iron or steel particles in place of the stone screenings with an additional coat of the cement on top of them.

Another group of patents, Nos. 727,505 to 727,512, was granted to Mr. Warren May 5, 1903. Three of these specify variations in the proportions of the various sizes of stone to be used, retaining a large proportion of the inherent stability of the mineral mass and increasing somewhat the proportion of voids; one of them using only stone less than one-quarter of an inch in diameter so mixed as to produce the minimum of voids. One of the patents in the group, No. 727,509, goes into the detail of variations in construction under the basic patent and adds to the two claims of the first patent, twenty-one additional claims, covering the quality of inherent stability of the mineral aggregate, the use of an excess of binder of cement, the grading of materials in predetermined sizes and proportions, compression of the composition, making an elastic and resilient structure, the wearing surface of a street so constructed, and the method of construction. Three of this group of patents relate to the details of processes, one to Mr. Warren claiming the method of approximating the sizes of stone, heating the stone, separating the hot stone into the desired number of grades of sizes, selecting the amount of

each size required and mixing with hot bituminous composition. The other two inventions, by H. W. Ash, the mechanical engineer of Warren Brothers Company, are of the combination of screens making the desired separations of sizes and of the entire collection of machinery required for handling the various materials from the pile of crushed stone to the wagon delivering the hot bituminous mixture to the street. The accompanying plate shows one of the plants constructed after the manner described in the patent. All the plants now in use by the company, twenty-six in number, are constructed in this manner and all sections are interchangeable. The plants are easily taken apart and transported.

It is evident from the above descriptions that other bitumens than coal tar can be used to advantage in the construction of bituminous macadam or bitulithic pavements, which names were coined for the description of pavements built under the Warren processes. Two of the patents of the group of May 5, 1903, are devoted to the improvement of asphaltums and asphalt compositions, and one to the method of constructing pavements with such asphaltums. One of

FRED J. WARREN, Pres. GEO. C. WARREN, Gen. Mgr. ALBERT C. WARREN, Vice-Pres.
H. M. WARREN, Treas. WALTER B. WARREN, Asst. Gen. Mgr. RALPH L. WARREN, Sec'y.

THE WARREN BROTHERS.

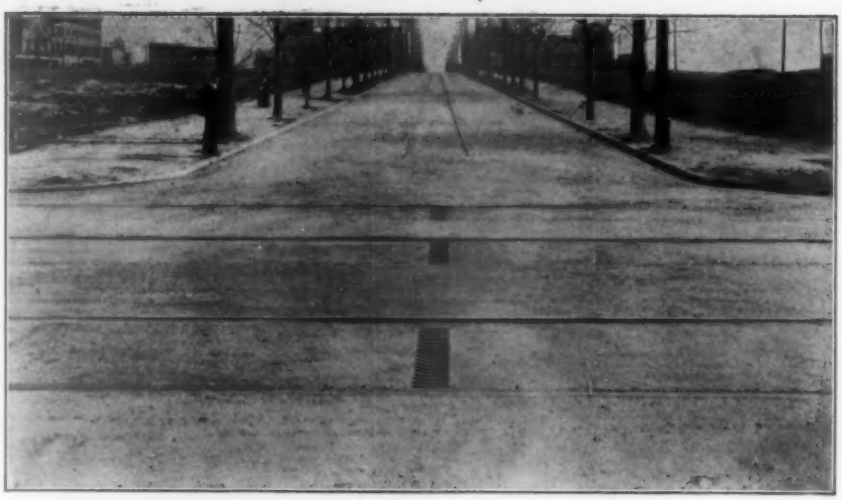
these patents contemplates the combination with a comparatively hard asphalt of a softer asphalt such as that distilled from the petroleums or asphaltic oils of Texas and Southern California, oils having an asphalt rather than a paraffin base, thus forming a bituminous cement suitable for the bitulithic pavement, softer than that ordinarily used in asphalt pavements, and not containing the paraffin oils characteristic of the ordinary petroleum residum oil used therein. Another patent sets forth the value of predetermined proportions of lamp black or free carbon in a mixture with asphalt in increasing its range of flexibility with changes in temperature, thus improving it for use as a binder or cement, and claims the mixture and the process of making it. The third patent mentioned claims an improvement in asphalt pavements by using the broken stone mixtures above described, having an inherent stability and an asphaltic cement of a softer consistency than one of 22 parts of petroleum residuum, 20 Baume, to 100 parts of Trinidad lake asphalt, a definite class under the general claims of the basic patent.

The process of laying pavements and the quality of the product have already been described in this magazine. A list of the articles on the subject will be found in vol. xxv, p. 27, June, 1903. The operation of the paving plant will be described at some future date. Several pictures showing steps in the process and completed pavements accompany this article. The descriptions accompanying the pictures fully explain them.

The development of the large paving industry now conducted under the above patents, since the first one was issued in 1901, has been phenomenal. It could have been successful only because all the details were carefully worked out by experts. A visit to the laboratory showed the thoroughness with which all materials are examined and tested from the time they are first offered until they are put in the finished pavement. All new materials, or those from new sources are carefully tested in the laboratory before purchase to insure the purity and uniformity of the paving cements. The laboratory is located at the refinery of the Warren Brothers Company in Cambridge, and the process of refining its bituminous materials is under its control.

The physical tests of bitumen are found to be most satisfactory in determining the quality of the products of refining accepted materials and the chemists of the company have devised ingenious and novel apparatus for making chemical and physical tests of bitumen and mineral ingredients. Special mention must be made of the original methods of testing the temperatures at which various grades of bituminous cements become brittle and the tensile strength at different temperatures and under different conditions of purity. Another piece of apparatus taking the place of the penetration test has been devised for use at the field plants for keeping watch upon the supplies of paving cements, which for this purpose acts promptly and without personal equation.

All stone proposed for use in pavements is tested for abrasion and for brittleness. Stones between 1¼ and 1½ inches in size are put in a cube which is a modification of that used in the U. S. testing department for highway materials, having holes in the corners for the fine particles to sift through as they become broken from the stone. After 10,000 revolutions the loss is determined and the condition of the remaining particles is examined. Brittleness is tested under uniform conditions with a pointed rod on a confined sample. A set of screens for determining the amount of each size of grain of stone, from 1½ inches to ½ inch through round holes varying by quarter inches in successive screens, and through square mesh screens from ¼ inch to No. 200, is mounted on a jigger, so that the sorting of sizes is a matter of but a few minutes. The determination of the proper proportion of sizes to give the minimum of voids is a longer operation. Experience has shown the probable proportions of various sizes and the sizes which should be omitted. A truncated cone of convenient size is first shaken full of stone of the largest size to be used. The approximate proportion of the next smaller size is then mixed with this mass and thoroughly shaken down with additions or subtractions of the smaller stone until the mixture fills the same volume that the largest stone originally filled. This process is continued with each successive size, and the amounts of each size are recorded. An aid in this study is the filling of the voids in a box of any given mixture with plaster of paris. When the mass is carefully broken up the form and volume of the voids can be studied in detail. In this manner the proper mixture of sizes for any accepted stone is determined and forms a part of the formula for pavements made with it. Part of the finest material, that passing the 200 mesh screen, is mixed with the bitumen in the kettle. When lamp black is used as the finest material, on account of its fine subdi-



BITULITHIC PAVEMENT, NEWPORT NEWS, VA.

THE FIRST BITULITHIC PAVING PLANT.

A. E. Schutte,
Supt. of Tests.

Horace W. Ash,
Mech. Engr.

G. H. Perkins, Jr.
Supt. of Refineries.

DEPARTMENT HEADS.

vision and porosity and the accompanying property of increasing the range of flexibility, this is particularly satisfactory, as shown in the patent description above, on account of the practical agreement of specific gravity of the solid and the hot liquid obviating the separation on standing, which is liable to occur when heavier fines are used.

A most important duty of the laboratory is the daily testing of the pavement mixtures as laid. A sample is taken each day from each pavement under construction and sent to the laboratory. There its physical characteristics are examined. The bitumen is then extracted in a special apparatus designed by Mr. Schutte and the amount

precedented growth of the business, the pavements laid under the Warren patents are uniformly good. The manner in which the necessity for expert supervision has been met as the business expanded is explained below.

The general acceptance of the new pavement and the consequent growth of the business have been unparalleled in their rapidity. The first patent was granted in June, 1901, and a sample pavement was laid at the refinery of the Warren Brothers' Company in April of the same year. The theory of the pavement was so satisfactory that pavements of 600 to 4,000 square yards in area were laid during 1901 in Lowell, Brockton, Holyoke, New Bedford and Cambridge, Mass.;

J. J. HOWARD, Boston. P. S. KAULL, Newport, R. I. C. O. WARREN, New York.

SOME GENERAL AGENTS.

determined. The remaining stone is then run through the set of screens and the amount of each size is carefully weighed and the proportions determined. The composition of the sample is then compared with the pavement formula for that particular street and any changes are telegraphed to the field superintendent. The location of each sample is carefully noted so that the records show the exact composition of each pavement at the point of taking each day's sample. These records will be as valuable in the future as the examination of the samples is at present.

The description of the operations in the Laboratory is made at some length to show the great care taken in all the details of the pavement construction, for it shows why, notwithstanding the unSalem, N. J., and Pawtucket, R. I., aggregating 14,400 square yards.

Judicious advertising added to the growing certainty that real advance in the science of paving had been made, spread the news of the early successes to all parts of the country and in 1902 contracts were completed for 440,831 square yards of the Warren pavements, in 35 cities, in 12 states and provinces, from 1,200 to 55,240 square yards in a city. Pavements were laid by the parent company in Brockton, Boston, Holyoke, Lowell, Waltham, Worcester, Everett, Taunton, Lynn, Nantucket, Brookline and West Newton, Mass.; Portland, Me.; Rome, Yonkers and Norwich, N. Y.; Newport News, Va.; Norristown, Conshohocken and Harrisburg, Pa.; Nashville, Tenn., and London, Ont. Sub companies laid the

pavements in Huntington and Montpelier, Ind.; Cleveland, South Brooklyn, Ironton and Cincinnati, O.; Newport, Ky.; Saginaw, Port Huron, Mt. Clemens and Bay City, Mich.; Tacoma, Wash., and Toronto, Ont.

In 1903 to June 1 contracts had been taken for 736,462 square yards additional to the above in 24 cities in 14 states and provinces in quantities varying from 2,343 square yards to 189,872 square yards, the latter in St. Louis. The cities included in this list are: Boston, Worcester, New Bedford and Pittsfield, Mass.; Newport, R. I.; Johnstown, Watertown and Niagara Falls, N. Y.; Newport News, Va.; Allentown and Norristown, Pa.; Nashville, Tenn.; London and Chatham, Ont.; Montreal, Que.; Glace Bay, N. S.; Bluffton and E. Chicago, Ind.; Cleveland, O.; Pontiac, Manistee and Kalamazoo, Mich.; St. Louis, Mo., and Duluth, Minn. The company has refused to consider business in many of the foreign countries including Africa, South America and Australia.

The paving season is only fairly opened on June 1, and many additional contracts are expected before its close. The company also has asphalt contracts in Toronto for 35,868 square yards, its plant

HON. ROBERT GWYNNE, Jr., SALEM, N. J.
New Jersey Manager.

being readily adapted to asphalt paving work.

The capital necessary to carry on this enormous amount of work is much less than that required for the permanent asphalt plants heretofore in vogue or even the portable railroad asphalt plants, on account of the high efficiency of the field plants, their comparatively small cost, and the ease and economy of moving them. Twenty-six of these plants were in operation in 1903, most of them on con-

FRANK P. MULLEN, CLEVELAND, O.
Northern Ohio Manager.

tracts of the Warren Brothers Company, several upon contracts of the companies licensed under the Warren patents, and two owned by the cities of Nashville, Tenn., and Montreal, Que. Two heavy steam rollers accompany each plant.

The growth in the business of the company has demanded a corresponding increase in the expert force of officers and employes; and the organization has been effected on lines which permit the expansion with a minimum of difficulty. The Warren Brothers themselves were most of them connected with the asphalt and coal tar industries in former years, and have been able to attract to them most of the best men formerly connected with the asphalt paving companies, so that their work has always been carried on by paving experts; and even with the enormous expansion of this year and last they have been able to secure the expert men necessary to continue this policy.

The brothers in the Warren Brothers Company are the sons of Herbert M. Warren, who was one of five brothers who developed the coal tar industry in this country and had a very large share in the development of the use of asphalt, especially in paving and roofing fields, and who were practically the only refiners of Trinidad asphalt up to 1885. A

sketch of the development of the industry by the older generation will be found in Municipal Engineering, vol. xx, p. 234. Portraits of four of the five brothers accompany this article

With such examples before them it is

C. E. MITCHELL,
Pennsylvania Manager.

natural that the eight sons of Herbert M. Warren should enter the asphalt and coal tar business, and the officers of the Warren Brothers Company are men of practical experience in the bitumen and paving fields. The Warren Brothers started business in 1899 as a co-partnership with Frederick J. Warren, Albert C. Warren and Ralph L. Warren as members. The company was incorporated in 1890 with Frederick J. Warren, President; Albert C. Warren, Vice-President, and Ralph L. Warren, Secretary. The first business in which the company engaged was the manufacture of roofing, bituminous concrete pavements and cement walks, and the Cambridge refinery was erected.

Meantime Mr. F. J. Warren was pursuing his investigations of the theory of bituminous pavements and evolved the form of pavement now so well known. He had special personal experience to fit him for this work as well as the combined knowledge of his family and business connections. His first connection with the business was in the refinery of the Warren Chemical and Manufacturing Company in New York, and he shortly went into the asphalt paving business with the first pavement of the Warren-Scharf Company and later with the Barber Asphalt Paving Company as foreman, assistant superintendent and superintendent in Denver, St. Joseph, Omaha and Chicago, and later manager of a subordinate paving company. The Denver plant maintained an asphalt laboratory.

When the bituminous macadam pavement was ready for construction the company was enlarged by the admission of several additional paving experts. Perhaps the most valuable of these new men was Mr. George C. Warren, now vice-president and general manager. He had his first experience in the refinery of the Warren Chemical and Manufacturing Company in 1881 when the asphalt paving was in its infancy, but soon went into the paving field with the Warren-Scharf company, making Utica, N. Y., his permanent location in 1888. From 1895 until January, 1901, when the company was absorbed by the trust, he was its general superintendent and one of its directors, having special charge of laying the asphalt surface and regulating asphalt mixtures. He was also a director in the

W. STUART SMITH, ROCHESTER, N. Y.
New York State Manager.

Warren Chemical and Manufacturing Company. In addition to his connection with Warren Brothers Company, he is president of the Warren Asphalt Paving Company, dealing in the Acme brand of California asphalt and laying pavements with it.

The efficient assistant general manager, Mr. Walter B. Warren, was an acquisition of the same date. He, as well as his brother Ralph, is a graduate of the Unichanical Engineering school of the University of Pennsylvania. He was formerly a superintendent for the Warren-Scharf Paving Company, and later with the Warren-Burnham Company on the water power development at Trenton Falls, N. Y. His grasp of the detail of the business management is notable. He has the additional duty of acting as the district manager of the company for New England.

Early in 1902 Mr. J. M. Wright joined the company. He was long connected with the Barber Asphalt Company as superintendent and manager, and was president of the Alcatraz Asphalt Company for a number of years. Mr. Wright became connected with Warren Brothers Company as vice-president and is now president of the Central Bitulithic Paving Company, operating important territory throughout Ohio, Kentucky and Michigan under the Warren patents.

Other directors of the Warren Brothers company are Herbert M. Warren, formerly superintendent of the refinery of E. B. Warren Company at Washington and of the Barber Asphalt Paving Company in Philadelphia; Geo. L. Stevens, President of the Warren Soap Manufacturing Company; Robert Gwynne, Jr., of Salem, N. J., and Albert P. Carter, attorney. A. H. Johnson, assistant secretary, was for twelve years superintendent for the Warren-Scharf Asphalt Paving Company, and H. F. Towle, auditor, was formerly treasurer of the same company.

The organization of the departments tributary to the laying of pavements is very complete, and is in the hands of experts of experience and high standing. The chemical department is in charge of Mr. A. E. Schutte, Ph. D., (Heidelberg), formerly with the Barber Asphalt Paving Company, who is the superintendent of tests, and E. C. Wallace, expert on paving mixtures. Mr. Wallace was formerly chief chemist for the Warren-Scharf Asphalt Paving Company, and was subsequently connected with Mr. Richardson in the New York Testing Laboratory operated by the asphalt company. A. Achtest, formerly with both the companies named, is the assistant superintendent of tests. The mechanical engineering department is in charge of Horace W. Ash, M. E., formerly with the Warren-Scharf Company, who designs, constructs, erects and moves the paving plants and machinery. In the refining department Mr. G. H. Perkins, M. E., is the superintendent of refineries, F. A. Reynolds the superintendent of the Washington refinery of E. B. Warren & Co., recently acquired by Warren Brothers Company, and E. Sutcliffe at the Cambridge refinery. The advertising department is in charge of Thomas F. Murphy. The original line of work of the company in the roofing and sales department is now in charge of W. A. Cross, formerly with the Warren Chemical and Manufacturing Company. Herbert M. Warren is superintendent of the concrete sidewalk department.

MAJ. GEORGE T. CASTLE,
District Mgr., Nashville, Tenn.

The rapid extension of the paving business has required the division of the territory covered. Two plans have been followed. In territory in which the Warren Brothers Company takes contracts directly district managers are appointed. C. E. Mitchell, formerly with the Block and Tile Paving Company of Pennsylvania, is in charge of the Pennsylvania district, with centers of operation at Norristown and Philadelphia. Robert Gwynne, jr., of Salem, N. J., takes care of the state of New Jersey. He is also a director in Warren Brothers Company. Walter B. Warren, assistant general manager of the company, looks after the New England district. W. Stuart Smith, formerly a district manager for the Warren-Scharf Company and the Warren Chemical and Manufacturing Company, has charge of

the state of New York with headquarters at Rochester. All these gentlemen were acquisitions of the year 1901. More recent additions to the force are Frank Mullen, formerly district manager for fifteen years with the Barber Asphalt Paving Company in New Orleans, whose district includes the territory tributary to Cleveland, O.,

J. M. WRIGHT.

V. P. Warren Bros. Co., and Pres. Central Bitulithic Co., Detroit, Mich.

W. G. MacKENDRICK,

V. P. & Mgr. Warren Bituminous Paving Co. of Toronto, Ont.

C. A. KENYON,

Pres. Hoosier Construction Co. of Indianapolis and of Granite Bituminous Paving Co. of St Louis.

and Maj. George T. Castle, formerly western manager for the Warren-Scharf Company, and one of the oldest superintendents of the Barber Asphalt Paving Company, having laid the first asphalt pavements laid in this country in both Washington and Boston, having been an associate of Gen. Averill before Mr. Barber entered the industry, who manages the southern territory, with headquarters in Nashville, Tenn.

The superintendents of construction in these districts are all of them experienced paving supervisors. Mr. R. W. Turner, who has charge of the work in Yonkers, has laid many brick streets and is thoroughly acquainted with the best paving practice. W. S. Houghton, with the Barber Company for ten or fifteen years, is in charge of construction in Boston. These gentlemen have been with the company since 1901. In 1902 the force was increased by the addition of several men. R. R. Hoyt, formerly with the Barber company, supervised the pavements in Norristown and Allentown, Pa. P. J Smith, who acted as superintendent for both the Warren-Scharf and the Barber Companies, is in charge at Newport, R. I. Frank S. Lockwood, from the Barber and Alcatraz Companies, is constructing pavements in Duluth. John Beard, formerly with the National Contracting Company, is at New Bedford, Mass., and J. G. Clark, M. E., formerly on the Shawinigan Falls power development with the Warren-Burnham Company, is doing much work at Worcester, Mass. C. O. Warren, a grandson of John Warren, and for twenty years a superintendent for the Barber Asphalt Paving Company, is a recent addition to the force in New York City, and Ethelbert Parker, C. E., formerly in the Cambridge engineering department, is the superintendent at Newport News, Va.

The parent company also has a number of general agents, Capt. J. A. Scott, long in the bituminous sidewalk and crosswalk business, J. J. Howard and P. S. Kaull, having their headquarters at the Boston office; R. W. Turner, at the New York office; Maj. George T. Castle in Nashville, Tenn.; Louis M. Pfeiffer in

GEO. W. SCHARF, SUPT.

D. C. BUNTIN, GEN. MGR.

GRANITE BITUMINOUS PAVING CO., ST. LOUIS, MO.

Denver, Colo., and W. H. Burns, formerly in the brick paving business and assistant city engineer of Cleveland, in Cleveland, O.

Wherever concerns are ready to organize or are properly equipped to lay pave-

ments under the Warren patents, licenses are granted by the parent company, and Warren Brothers Company acts only in the capacity of furnishing uniform grades of material, proper machinery and expert advice. The Hoosier Construction Company of Indianapolis has built up quite a business in Indiana for the bitulithic pavement, having taken contracts in Huntington, Montpelier, Bluffton and East Chicago. It has built many wooden block streets and its president, Mr. C. A. Kenyon, was for many years the manager of this district for the Western Paving and Supply Company, constructing asphalt pavements.

The Central Bitulithic Paving Company has its principal office in Detroit and operates principally in Michigan, Ohio and Kentucky, but has also secured contracts in Maine. Its president is now J. M. Wright, as stated above. The treasurer of this company is G. H. Wykoff, formerly with the Barber and Warren-Scharf companies. M. F. Offutt is acting as superintendent of large contracts at Kalamazoo, Mich. He was formerly superintendent for the Barber and Alcatraz companies. A. W. Lindsay, formerly with the same companies, supervised the work at Cincinnati and Ironton, O., and Mt. Clemens, Mich.

The Warren Bituminous Paving Company of Ontario, limited, of Toronto, is in charge of W. G. MacKendrick, vice-president and manager. He has been superintendent for the Barber and Warren-Scharf companies in New York City and in Canada. Lewis Skaife, C. E., formerly representative of the Warren-Scharf and Barber companies, is superintendent of the work in Montreal, and C. C. Curtis, formerly with the Barber Company, is in charge of the construction at London, Ont. The city of Montreal has purchased one of the paving plants.

The Nashville Roofing and Paving Company of Nashville, Tenn., is doing much work in Nashville. George M. Ingram, president of the Engineering Association of the South, is president and William M. Leftwich, jr., C. E., formerly city engineer of Nashville, is the general manager of the company.

The Warren Construction company of Seattle, Portland and Tacoma has for its president T. W. Nottingham, for ten years superintendent for the Warren-Scharf company in Syracuse, and as its treasurer W. E. Hacker, ex-commissioner of public works, Tacoma. J. O. Hoyt is the superintendent of construction. He was formerly a superintendent for the Warren-Scharf Company.

The Granite Bituminous Paving Company of St. Louis is a recent addition to the list of companies operating under the Warren patents. The validity of more than half a million dollars' worth of contracts has recently been affirmed by the courts. The president of the company is Mr. C. A. Kenyon, also of the Hoosier Construction Company. Mr. D. C. Buntin, the treasurer and general manager, is well-known in the United States as the principal contractor for the Parkhurst combined cement curb and gutter. The superintendent of construction is George W. Scharf, one of the oldest bituminous workers in the United States and formerly manager of the Fruin-Bambrick company, contractors for asphalt and other pavements.

The latest addition to the list of licensees to construct pavements is the Nebraska Bithulithic Company, of Omaha, Neb., of which John Grant is the vice-president

G. M. INGRAM, PRES.

W. M. LEFTWICH, MGR.

NASHVILLE ROOFING & PAVING CO., NASHVILLE, TENN.

T. W. NOTTINGHAM,

Pres. Warren Construction Co., Seattle, Wash.

JOHN GRANT,

V. P. Nebraska Bitulithic Paving Co., Omaha, Neb.

and general manager. Mr. Grant has been connected with the laying of asphalt pavements from the very beginning; first in the employment of the City of Washington and later as general superintendent of the Barber Company and as president of the Grant Paving Company and other organizations engaged in various kinds of paving. His long and varied experience is of great value to him and to the companies with which he is now connected. Mr. Grant had charge of the construction of the coal-tar pavement laid on Massachusetts-ave. in Washington in 1873, which pavement is still in good condition; and as the Omaha papers indicate, he is an enthusiast on the merits of the new pavement

The success of the Warren Brothers' Company depends largely upon three excellent business principles— (1) the offer of excellent materials and methods for paving, and of expert aid in constructing streets therefrom; (2) a well-planned and extensive advertising campaign, making known the good points of the commodity offered, and (3) a conservative financial policy which keeps the outgo in its proper relation to the income. Aside from the straightforward application of these principles, the company has been fortunate in the choice of a time for entering the field. The peculiar conditions in the asphalt field, owing to the recent peculiar financial manipulations of companies operating it, have caused cities to accept promptly a substitute for the old methods of construction which retains its good qualities and introduces new and advantageous features. The changes in these companies have set free so many of their expert employes and have made others so willing to change, that the Warren Brothers Company has been able to secure competent superintendence of its work as rapidly as the need for it has arisen.

The company has increased its capital from time to time, now having over $500,000 permanently invested in the business. The company has recently authorized an increase of half a million dollars of its securities to take care of the rapid developments. The Warrens have always been consistent advocates of the plan of municipal construction of bituminous pavements, and the cities of Nashville, Tenn.; Salem, N. J.; Brockton, Mass., and Montreal, P. Q., have arranged with them for the purchase or lease of plants and build the pavements themselves.

CEMENT

Statistics—Pacific Coast Manufacture—Effect of Fine Material on Strength.

Cement Statistics.

The May number of the "Monthly Summary" issued by the Bureau of Statistics of the United States Treasury Department gives the details of the exportation of cement from the United States to many other countries for each year since 1897. Prior to 1897 the figures are given for cement and lime together for the years 1892 to 1896.

The principal countries to which exports are made are Canada, with 13,212 barrels in 1897 and 273,894 barrels in 1902; Mexico, with 3,295 barrels in 1897 and 23,637 barrels in 1902; Cuba, with 633 barrels in 1897 and 53,570 barrels in 1902. The exports to any other country did not exceed 9,000 barrels in 1902. The total exportation was 36,490 barrels in 1897, 48,836 in 1898, 64,122 in 1899, 76,055 in 1900, 218,240 in 1901 and 392,462 in 1902. A more than tenfold increase in the six years.

Imports of Roman, Portland and other hydraulic cements are also reported for each year since 1892. The importations were 2,829,000 barrels of 380 pounds each in 1892. They reached a maximum of 3,147,000 barrels in 1896 and diminished to 1,115,000 barrels in 1902. In the latter year 598,000 barrels were imported from Germany, which is much less than the maximum of 1,439,000 barrels imported in 1896 from that country. In 1902 437,000 barrels were imported from Belgium, as compared with 781,000 barrels in 1896. Less than 25,000 barrels were imported from England in 1902, as compared with 1,187,000 in 1892. There has been a steady decrease in English importations every year since 1892. France sent 120,000 barrels in 1902, The Netherlands 40,000, Sweden and Norway the same and Japan 20,000 barrels. Small quantities were also received from Austria-Hungary, Denmark, Italy, Mexico and Hong Kong.

The imports in May, 1903, from all coun-

tries were 228,000 barrels, as compared with 37,000 in May, 1902. For the eleven months ending with May, 1903, the imports were 2,648,000 barrels, as compared with 1,002,000 in the same period in 1902, showing that the demand is still greater than the domestic supply. The usual reduction in exports is observed also, being 29,109 barrels in May, 1903, and 46,869 in May, 1902; and 255,977 in the eleven months ending May, 1903, as compared with 355,813 in the same time in 1902. Re-exportation is likewise less by nearly 25 per cent. for May and over 60 per cent. for the eleven months. Scarcely more than one-fifth as much foreign cement was in storage at the end of May as at the same time last year.

Investigation of Cement Manufacture on Pacific Coast.

A commitee of United States engineers has been appointed by the government to investigate cement manufacture on the Pacific coast. The committee, composed of Maj. John Millis of Seattle, Lieut.-Col. Thomas H. Hanbury of San Francisco and Maj. William C. Longfitt, was to meet in San Francisco about July 10. The government is desirous of determining the extent of cement manufacture on the Pacific coast, and will endeavor to secure the name and location of each manufacturer, the capacity of his plant, length of time it has been in operation, and the methods employed in the manufacture of cement.

Strength of Cement Mortar with Various Percentages of Fine Material.

An addendum to a paper by E. S. Larned, C. E. of Boston, Mass., before the American Society for Testing Materials gives the results of a number of experiments made by him when division engineer with the Metropolitan Water and Sewerage Board of Boston, Mass., on the influence of different percentages of fine material in cement mortars, using two brands of natural hydraulic cement and one of Portland cement. Mr. Larned makes the following statements of the methods and results.

A tabulation is added showing the tensile strength of cement mortars in the proportion of one part of sand to one of cement, by weight, for Rosendale or Natural cements, and two parts sand to one cement for the Portland. A silicious sand was selected for this test, carefully screened to the sizes noted and combined in the proportions given in the table. The test was made to determine the relative value of sand grains of different diameters, in combination with cement, and also to study the effect upon the tensile results of adding fine material.

Few unwashed natural sands are free of dust, of a loamy or clayey nature, containing a high percentage of organic material, and in specifications, usually calling for sand, clean and sharp and free from fine material, the importance of excluding this deleterious agent is recognized, but it is not always possible to enforce this absolutely, and from mechanical analysis of a large number of samples, and casual inspection of sand in use at various points, I am satisfied that much sand is used that contains 5 per cent. dust and a good deal that carries as much as 10 per cent., and even more in some instances.

The fine material passing the No. 100 mesh screen, used in this test, was obtained from a clean white silicious sand, and if, with increasing amounts of this material, a falling off in tensile strength appears, it can, in no sense, be taken as a measure of what would follow by using sand containing a dust of loamy or clayey nature, but is in a way suggestive. The cements used in this test were of the same sample as in the other tests previously referred to.

The sand mortar test is the true basis upon which to judge the value of a cement, and I believe the proportion of sand to cement should be the same as employed in the actual work of construction. Unfortunately, this was not carried out in the above test of the natural cements, for the reason that results were not desired, for purpose of comparison, with previous tests in the same laboratory, in which the crushed quartz or standard sand was used in the proportion of one part sand to one of cement.

Explanation of the results is hardly required. It will be noticed, particularly in the natural cements, how uniform and constant is the falling off in strength at the seven-day period, as the amount of fine material increased. This tendency, in the case of Union, disappearing at the twenty-eight-day period, at which time rather remarkable uniformity is found in all the combinations, except the 100 per cent. "fine." Serious retardation in the improvement of the Hoffman, with the addition of fine material in the sand, is noticed between the seven-day and twenty-eight-day periods, the mixtures containing over 5 per cent. "fine" remaining almost latent for this time, three of the combinations showing an actual loss, while four make a small gain, the average gain being two pounds. A rapid recovery is found, however, in these combinations between the twenty-eight-day and six-months periods, and it is to be regretted that longer time tests were not made.

A tabulation of the results, excluding the series in which all "fine" and crushed quartz were used, is herewith given:

	7 days.			28 days.			6 months.		
	Aver.	Max.	Min.	Aver.	Max.	Min.	Aver.	Max.	Min.
Hoffman.	84	118	62	99	163	70	277	316	221
Union....	139	156	103	198	222	183	336	362	302

The effect of the fine material upon the Portland cement is not so noticeable, even at the shortest period, except in the series with 100 per cent. and 50 per cent. "fine," and no parallel can be drawn between the test with Portland cement, and the results with Rosendale cement, using the same combinations of sand.

TENSILE STRENGTH OF CEMENT MORTAR WITH SAND GRAINS OF DIFFERENT DIAMETERS.

Results given are the average of 6 Briquettes.

Sand Gauge. Per Cent. Used.				Natural Cement Mortar, 1 to 1.								Portland Mortar, 2 to 1.			
					"Union."				"Hoffman."				Giant.		
No. 30	No. 20	No. 100	Fine.	Water, Per Cent.	7 Days	28 Days	6 Mos.	Water, Per Cent.	7 Days	28 Days	6 Mos.	Water, Per Cent.	7 Days	28 Days	6 Mos.
100	.....	.....	.....	17	156	193	352	15	115	163	314	10½	286	288	412
.....	100	.....	.....	"	151	194	349	"	118	146	286	"	294	331	473
.....	.....	100	.....	"	153	187	340	"	91	110	257	"	201	226	294
.....	.....	.....	100	"	100	123	307	"	71	76	186	"	129	159	223
80	10	10	.....	"	154	210	358	"	94	124	301	"	361	380	486
70	15	12½	2½	"	142	190	332	"	86	107	254	"	301	303	428
60	20	15	5	"	143	192	342	"	83	107	285	"	307	311	419
50	25	17½	7½	"	140	208	345	"	80	89	291	"	391	400	538
40	30	20	10	"	133	197	362	"	90	82	296	"	350	355	475
30	25	30	15	"	123	191	329	"	78	77	266	"	362	359	478
20	20	40	20	"	128	199	318	"	66	73	285	"	317	374	480
10	15	50	25	"	122	201	324	"	68	72	221	"	291	354	488
50	.....	.....	50	"	108	193	317	"	62	70	239	"	247	287	351
50	50	.....	.....	"	154	222	323	"	82	107	316	"	440	408	542
50	.....	50	.....	"	150	210	344	"	78	88	290	"	309	336	438
25	25	25	25	"	125	183	302	"	74	68	250	"	279	337	447
Crushed Quartz.															
40	.....	60	.....	16	179	256	3 Mos 355	14	93	100	3 Mos 142	9½	257	331	3 Ms 351

Memo: All proportions and percentages determined by weight.
Natural sand used, first passed through No. 8 screen and residue excluded.
No. 30 sand passed No. 20 screen and caught on No. 30 screen.
No. 20 sand passed No. 8 screen and caught on No. 20 screen.
No. 100 sand passed No. 30 screen and caught on No. 100 screen.
"Fine" is clean white sand sifted through the No. 100 screen.

WATER

Washington Water-Works—Austin Rates—Investigation of Waste—Expansion of Chicago Drainage District.

Water Works of Washington, D. C.

The annual report of Col. A. M. Miller, engineer officer in charge of the water supply system of the District of Columbia, was submitted to Col. Mackenzie, acting chief of engineers, July 21. The Washington aqueduct tunnel and the Washington city reservoir were placed in service January 8, 1902, increasing the head of water throughout the entire gravity system from twelve to twenty feet. The total present storage capacity of all the reservoirs of the system is about 637,000,000 gallons or about eleven days' normal supply. Col. Miller says that "until the average daily consump-

tion of water becomes considerably greater than at present the reference of the surface of the water for the lowest stage of the Potomac will be about 151 feet at the mouth of the feeder at Great Falls, about 146.75 feet at the Dalecarlia reservoir, and 146 feet at the Georgetown distributing reservoir. The total supply of water which the present conduit can safely furnish, without a pressure dangerous to its safety, is 76,000,000 gallons per diem. This, however, necessitates the lowering of the Georgetown distributing reservoir to reference 144, thus involving a loss of head of two feet at that point of distribution.

Measurements of the daily and hourly consumption and waste of water were made each month except September, 1902, and February, 1903, and show an average of eleven measurements of consumption and waste for the fiscal year of 58,237,646 gallons for each twenty-four hours. The last measurement made, June 25-26, showed a total consumption and waste of 59,579,900 gallons. This is over 205 gallons per capita per diem.

Careful and trustworthy investigations and measurements made in various cities in the United States show clearly that a per capita daily consumption of 100 gallons is ample for all domestic, business and public purposes, and that any considerable increase above this amount must be attributed to waste, due to defective mains and service pipes, defective plumbing and willful waste.

This extravagant use of water has become a serious menace to the supply of water by the Washington aqueduct with its present capacity.

A filtration plant has been authorized by congress and is now being constructed. The probable cost of filtration will be about $6 per million gallons, or at the present rate of consumption, about $300 per day or $110,000 annually. He says:

This is a large charge and can only be reduced by a reduction in consumption.

The existing conditions suggest two remedies, either the reduction of consumption to a reasonable rate, 100 gallons per capita per diem, or the increase of the present supply to keep up with the present unreasonable and extravagant demand of 205 gallons per capita per diem.

The first remedy, the reduction of consumption, can only be accomplished by the introduction of meters. This is a positive and certain method and has been shown by actual experience to be perfectly feasible. However, whenever this subject of the introduction of meters has been brought to the attention of congress it has failed to meet approval.

The introduction of the meters will not prevent an abundant supply for all purposes, will result in a less water rate or expense to consumers and would throw the burden of waste where it belongs, on the shoulders of the careless and willfully negligent consumers.

The second remedy is an increase of the water supply to meet future demands at the present extravagant rate of consumption. This involves the building of a second conduit from the Great Falls of the Potomac, with the necessary reservoir, if any, and proper gate houses and operating plant. In order that this subject may have proper consideration, with due deliberation and prevision, a survey of practicable routes is essential. These surveys should be taken in hand at once. The estimate for the survey is $8,000.

Austin Water Rates May Be Reduced by City.

Judge Grosscup, of the Illinois Federal court, denied the petition of the Chicago Suburban Water and Light Company for an injunction to restrain the city from enforcing the ordinance reducing the water rates in Austin. The petition is denied on the ground that its enforcement would not impair an existing contract, and that federal jurisdiction could not extend over the matter, no showing of the impairment of existing contracts having been made. Judge Grosscup said:

The power to establish water works and to regulate rates reposed originally in the state. It could be transferred to the municipality only by legislation. It is incumbent on those who claim a transfer to point out the specific legislation. The language in this case may convey power to establish rates, not for the time being, but for the long period claimed. In the absence of clear intention, the presumption is the legislature has conferred no such power.

Results of an Investigation of Amount of Free Water Supplied to the City of Richmond, Ind.

The following paper on water waste was presented to the last convention of the American Water Works association by Howard A. Dill, superintendent of water works, Richmond, Ind. It is slightly abbreviated as regards the tabular detail.

In Engineering Record, Sept. 22, 1900, is given results of observations in Washington, D. C., on amounts of water used in schools, drinking fountains, flush tanks, etc. In eighty-eight schools the average annual consumption for each building was found to be 833,841 gallons. At a 6 cent rate this consumption would be valued at $50.03 a year.

From tests of 114 flush tanks, the average annual consumption of each tank

was 906,548 gallons, or a daily consumption of 2,484 gallons. At a 6 cent rate the annual consumption for each tank would have a value of $54.39.

For eighty-one drinking fountains the average annual consumption by each fountain was 1,641,941 gallons. Commercially this consumption would represent a value of $98.52 per annum.

In June, 1899, the writer became superintendent of the Richmond city water works, a private corporation, and in a short time thereafter steps were taken to reduce the waste of water. The principal sources of waste were found to be several factories and livery stables, which were charged at schedule rates; direct motors, or those which pump rain water without the use of a supply tank, elevators, and services supplied with free water according to contract with the city.

The first class, namely factories and livery stables, was metered, resulting in a largely increased revenue.

The second class, direct motors, was also metered where continued, resulting in a greatly decreased consumption or waste. At present only two or three motors remain direct, all others having been equipped with tanks to hold a supply of rain water. In one instance, a direct motor, in five and one-half months, caused a meter registration of 628,575 gallons. The company afterwards learned that this motor had been out of service during that period and could not be used for pumping rain water. The water thus registered simply passed through the leaky valves into the sewer.

The third class, elevators, has been inspected monthly, and where repairs were neglected, meters were installed with satisfactory results. The most flagrant case in this class was that of a passenger elevator run at irregular intervals. A meter was set without knowledge of the consumer and simultaneous readings taken of meter and elevator clocks, showing a waste of 21,589 gallons in four days. Needless to state, that elevator was immediately repaired when this report was presented to consumer.

The fourth class, namely free services, comprises ten school houses, two hose companies, a city hall, jail and hose company supplied through one service, nineteen drinking fountains and fifty-seven flush tanks for sewers. These proved the most wasteful and hardest to control, showing conclusively that neither municipal nor private company should furnish water in this manner. Feeling confident that the flush tanks were not being properly inspected by the municipality, this company began an independent investigation. Each tank was visited, and with a standard gallon measure, the time was noted for a flow of one gallon.

Mr. Dill gives a table of the flush tanks examined, showing that two discharged 205 gallons once in 24 hours, one gallon flowing into the tank in 420 seconds. At the other extreme were three tanks discharging 17,280 gallons in 59 flushes a day, taking but five minutes to flow a gallon.

Fifteen tanks discharged less than 1,000 gallons a day, 12 between 1,000 and 2,000, 13 between 2,000 and 4,000, 12 between 4,000 and 10,000 and 5 more than 10,000 gallons a day. The total discharge was 223,376 gallons in 24 hours or 81,532,245 gallons in 365 days.

Taking an average capacity of tank at 325 gallons, which is liberal, and allowing two flushes a day, gives an annual consumption of 255,000 gallons per tank, and for 57 tanks, an annual consumption of 14,563,500 gallons, under properly regulated conditions. The difference, 66,967,745 gallons, shows the amount of water wasted, and of no benefit in a scientifically constructed sewer system. A report of above test was presented to the city officials, and with their hearty co-operation, a monthly inspection is now made by a representative of the city and one of this company. Each tank is provided with a compression bibb faucet and a pet cock. The former can be used to fill the tank when a rapid test is desired, but the pet cock is used to regulate the ordinary flow. At each inspection it is found that the openings in many of the pet cocks have been enlarged, requiring a new fixture or a readjustment. Such repairs are made at the expense of the city, and a year's experience of this method has proved satisfactory.

A similar test was made with the drinking fountains or stock watering troughs, result of test showing nineteen fountains flowing from 596 to 3,927 gallons a day, a total flow in twenty-four hours of 38,086 gallons and a total flow in 365 days of 13,901,390 gallons.

Meters were also placed on all schools and readings taken as nearly monthly as possible. Even in schools having same number of fixtures, there is a wide range in the consumption. This is due principally to the character of the janitors at the different schools, and is a matter difficult to overcome. Monthly reports are sent to the superintendent of schools, and with assistance, the consumption is reduced to a point probably as low as can be secured under a free service system.

Table 1 shows the annual consumption for five years ending July 1.

TABLE 1.

1898	742,279,912
1899	738,861,992
1900	650,167,374
1901	615,848,310
1902	583,472,646

Table 2 give number of meters in use for same years.

TABLE 2.

1898	321
1899	
1900	571
1901	664
1902	839

The increase in the number of services in use in year ending July 1, 1901, was 50 over July 1, 1900, and for year ending July 1, 1902, was 167 over year ending July 1, 1901.

As previously shown, the estimated annual reduction in consumption by flush tanks is 66,967,745 gallons. From table 1 the difference in consumption for years ending July 1, 1901, and July 1, 1902, was 32,375,664 gallons. This apparent error in amount saved by flush tanks may be largely accounted for by the additional consumers for same years, whose annual consumption would amount approximately to 30,000,000 gallons.

The foregoing data show conclusively that the annual waste has been reduced principally in the flush tanks, assisted by the use of meters and careful inspection of fixtures.

Estimating annual consumption of each flush tank at 255,500 gallons, the same at a six-cent rate would represent a value of $15.33. The $100 rate of many cities at a rate of six cents would equal an annual consumption of 1,667,000 gallons, or a daily flow of 4,567 gallons. Taking a tank with a capacity of 350 gallons, this flow indicates that the tank would flush about eleven times a day. Even estimating a tank with a capacity of 500 gallons, the allowance above would represent a flushing of nine times a day. No hydraulic expert would justify such a requirement, so we can only conclude that the value of water furnished has been over-estimated or the tank is of prodigious size.

From the test on the nineteen drinking fountains the average annual consumption for each was found to be 731,652 gallons, which at a six-cent rate, would have a value of $43.90.

The consumption at two hose houses from January 1, 1902, to January 1, 1903, was 470,643 gallons, an average of 235,321 gallons, giving a cash value for each house of $14.11. The consumption at hose house 2, city hall and jail was 2,896,847 gallons, giving a value of $173.81.

The total consumption at ten school houses for same period was 6,099,126 gallons, an average of 609,909 gallons. At a six-cent rate, the value of water furnished each school building would be $36.59.

Referring to table 1 for consumption for years 1898 and 1902 and estimating population for same years as 18,000 and 19,000 respectively, census of 1900 gave 18,226, it is seen that the daily per capita consumption was 113 and eighty-four gallons respectively, showing the very material reduction which resulted from the tests and metering previously given. Richmond is chiefly a manufacturing city and with a large railroad consumption, the above per capita consumption will probably compare very favorably with other cities under like conditions.

Expansion of Chicago Drainage District Powers and Territory.

The engineering committee of the Chicago Sanitary Board decided, at a meeting held in Chicago July 13, to develop the water power of the drainage canal at Lockport and Joliet before the auxiliary channels through the Evanston and Calumet districts are begun. Chief Engineer Randolph was directed to complete plans at once, and bids will be received about Oct. 1 for the work. The plans being prepared for the development of the drainage canal water power provide for the installation of machinery at Lockport and Joliet capable of furnishing 27,000 net horse-power, at an estimated cost of $2,700,000. The trustees expect to have their plant in operation within two years. Under the new statute authorizing the board to develop water power permission is given to levy a special tax of one-fourth of 1 per cent. of the equalized valuation of the sanitary district annually for three years to pay for the work.

The board also instructed Chief Engineer Randolph to proceed with surveys for a north and south auxiliary channel and estimates of cost. The engineering department will probably submit two plans for each route. The estimated cost of constructing these two auxiliary channels to keep the sewage of the annexed districts out of Lake Michigan is $16,000,000. The law providing for the annexation of the Calumet territory and Evanston to the Chicago drainage district went into effect July 15. The annexation law makes no provision for the funds necessary for doing this work and further legislation will have to be enacted before the improvement can begin.

PAVING

Invalid New Orleans Sidewalk Assessment—Heat of Pavements—Invalid Chicago Assessment—Convict Labor in Porto Rico—Bitulithic Pavement in New York—Asphalt Specification in New Orleans—The Asphalt Trust Promotion Profits—Asphalt Contracts in Philadelphia.

Confiscating Assessment for Sidewalk in New Orleans Invalid.

A decision was handed down June 15 by Judge T. W. C. Ellis of Division A, Civil district court, New Orleans, La., in the case of George Redersheimer vs. Henry J. Bruning, reconvenor. The suit grew out of a paving contract in which a sidewalk was built and paved with brick on the side of two squares of vacant ground owned by plaintiff when suit was brought. It is shown that these squares are located in the lowest part of the city, the land being unsettled, marshy, and fit only for cow pastures. Judge Ellis says:

The idea of sidewalks and pavements through that region seems grotesque, but nevertheless the council in ordinances No. 10,884, etc., ordered brick pavement and accepted reconvenor's bid, contracted with him, and at the end of his work he received the certificate of the engineer and commissioner of public works, recorded them and this suit involves his right to recover for the work.

The squares then were worth perhaps $100 to $250 each, but much more now. The account and certificate as amended in 1901 itemize the work as follows:

Here the court gives the items which figure up a total of $2,126.60, and continuing thereafter says:

The owners never received any notice to fill and grade these squares as required by act 114 of 1886. They did not know that the work was going on until it had been completed, and a recorded lien of $2,125 had been fastened on their two "cow pasture" squares, worth together perhaps $200 to $500.

After the Barber Asphalt vs. Watt decision, 5th Annual, 1345, the reconvenor had new certificates made out, not on any new measurements, but on the old ones, and the assistant engineer, Mr. Warren, who prepared the new certificates, testified that the cost of the brick work was apportioned according to the said Watt decision, but all the other items of the said two accounts were not only apportioned, but were charged to said squares of ground respectively.

This of itself defeats reconvenor's claim as contractor, for the principle of the Watt decision is fatal to it.

But this is not the most serious difficulty, because at least all of the account sued on, except probably the brick, was without the authority of the law. Nay, more, the contract, the work, the certificates were grossly illegal because of the want of authority in the city council. The laws on the subject of grading or filling of sidewalks, and of paving are distinct, just as grading or filling is one thing and paving is another thing. To grade, we cut down to a level or fill in, with soil or another material in order to bring up the surface of the work, while paving is simply laying a concrete of brick or stone on the crown or top surface of the work.

The court here cites the act requiring the city to notify the property owners to grade, according to lines provided by the city. Where the city fails to give such notice it is without power to grade the sidewalk, as is this court. He says:

The engineers on the witness stand testified that it was found impossible to enforce or apply act 114 of 1886, because there were not enough employes in the office to give notice.

This excuse is a rather original method of setting aside a law of the state, made to govern and control the city, in the very matter here under review—grading and filling. But it is full confession that the owners were not notified and this fact is also fatal, absolutely so, to plaintiff's every account, with the exception of one item of brick work or paving.

This item, the court declares, is all that can possibly remain of reconvenor's account.

Therefore it seems to me that the claim sued on is not only illegal, in the particulars above noticed, but that it is absolutely destitute of any moral or equitable consideration. Those who deal with municipal corporations must, at their peril, know the limitations placed by the law upon their powers, and that from their ultra vires acts legal obligations can not originate. If this rule be not enforced there is no protection for the citizen. Judgment against H. J. Bruning, reconvenor, rejecting his demand and for costs.

Heat Radiated by Various Pavements.

A test of paving material was made by C. H. Burchinal, of the Lake Erie Asphalt Block company, Toledo, O., July 4, for the purpose of ascertaining the radiating qualities of different materials. The test was made by means of two thermometers. One was placed on the pavement and the registration taken, the other six feet above. According to the

test, block stone is the coolest and sheet asphalt the warmest material. The result of the test was as follows, the figures being degrees of Fahrenheit:

Material.	Six feet of Elevation.	On Surface.	Radiation.
Block stone	109	111	2
Creosoted wood ..	110	113	..3
Asphalt block	110	117	7
Brick	109	119	10
Sheet asphalt	110	126	16

A Washington citizen tested an asphalt pavement with thermometers at the street level and ten feet above. He found five degrees difference at sunset and that the difference was less than half a degree at 9 o'clock, disappearing at 11.

Change in Specification Invalidates a Chicago Street Assessment.

In a Chicago special assessment case carried to the Illinois supreme court recently, that tribunal found fault with the manner in which the proceeding had been conducted by the board of local improvements, and refused to confirm the assessment finally. The court held that after the adoption of the improvement resolution a condition providing for half an inch of granite screenings was added, and that the estimate by the city engineer as to the cost of the improvement was not made a part of the original resolution passed by the board of local improvements, as is provided by the law. The decision affected a small stretch of streets only, but as the same condition obtained in all macadam contracts held by John P. Agnew & Co. that firm notified the Chicago board of local improvements to cancel contracts which it had secured. These contracts embraced twenty-one streets or eight systems and involved a total of $720,000.

Convict Labor on Porto Rican Roads.

Convict camps are being established at two important points in Porto Rico, and it is believed that by Aug. 1 several hundred prisoners will be employed in building roads. The law under which this experiment is to be conducted was passed at the recent session of the legislative assembly of Porto Rico. It provides that all male prisoners over the age of eighteen years, and who are under a final sentence for a term of more than two years, may be put to work upon the public roads of Porto Rico under a guard of insular police, the work being under the jurisdiction of the commissioner of the interior. The law also empowers and directs the commissioner to begin the construction of a road from Jayuya to a point between Ponce and Adjuntas, on the Ponce-Arecibo road, and of a road from Humacoa to Yabucoa, establishing convict camps for the maintenance of discipline and treatment of the prisoners employed. Not less than 150 convicts are to be employed on each of said roads.

New Asphalt Specifications in New Orleans.

The specifications for asphalt paving on Canal-st. in New Orleans have the novel provision that no asphalt made from the residuum of oil or petroleum shall be used. The reason for this is not stated, but it gives rise to an investigation of the product to be used by the successful bidder, the Union Development company, to retermine whether it is natural asphalt or one produced by distillation from oil.

Bitulithic Pavement in New York.

The appeal of the city of New York from the decision of Justice O'Gorman restraining the city from letting a contract for bitulithic pavement on Seventh-ave was argued in the appellate division June 12 and Justice Ingraham handed down his decision July 7. While he sustains the order in the specific case, he expressly dissents from the position taken by the lower court that a patented pavement can not be laid in the city and overrules this part of the decision. He points out the method in which the board of estimate and apportionment might use in making contracts for laying patented pavements.

The statement of the decision of the lower court is given on page 44 of the July number of Municipal Engineering.

Justice Ingraham's directions are as follows:

In order to contract for a patented pavement bids should be received in some other form of pavement as well as on the patented pavement, and if the bid on the patented pavement is lower than those on the other forms of pavement selected to be placed in competition, then the president of the borough could award the contract for the patented pavement without further consideration. If, on the other hand, it was desired to award the contract for the patented pavement at a higher price than the low bid, then it would be necessary to have the matter referred to the board of estimate and apportionment, and the contract should be let for the patented pavement by a two-third vote of said board. The corporation counsel has advised the presidents of the

various boroughs of Greater New York that they can proceed to advertise for the use of Warren's bitulithic pavement under its decision.

Suits for Asphalt Promotion Profits.

By Wm. B. Bray.

Following upon the decision of July 6 by Judge Kirkpatrick of New Jersey, ordering Receiver Tatnall of the Asphalt trust to bring suits to compel a coterie of Philadelphia financiers to disgorge a part of the $4,003,000 profits alleged to have been made by them and his order of July 20, authorizing the suits in any district of the United States, Mr. Tatnall, on July 20, began suits in assumpsit in both the United States circuit court and the common pleas court of Philadelphia. Six summons in assumpsit were filed, naming as defendants William J. Latta, Sidney F. Taylor, George D. Widener, George W. Elkins, William L. Elkins and E. Burgess Warren.

It is alleged in detail by the receiver that the history of the asphalt promotion contains a startling story of inflated valuations and reckless financiering. According to Mr. Tatnall, statements will be filed in a few days from this writing (July 22). The fact that Receiver Tatnall has simultaneously brought suit in the United States and local Philadelphia courts, is taken to mean that he intends to take every advantage of the latitude allowed under Judge Kirkpatrick's decision and will try to close every avenue of escape for the promoters should they be found to have violated any of the practices of honest and straightforward business.

The bringing of these suits by the receiver is said to clear the way for another series of suits by counsel for the non-assenting bondholders. Their holdings aggregate, it is said, about $300,000 and J. Douglass Brown, jr., says he intends to sue for their claims in a few days. Mr. Tatnall's suits, however, are said to include these non-assenters as well as the assenting bondholders, all of whom, in the event of a successful issue, would share pro rata in the proceeds.

The cases represented by James W. M Newlin will also be begun in a few days.

Counsel for some of the non-assenting bondholders do not usually admit that Receiver Tatnall's plan is for their best interests or even for those of the 97 per cent. who accepted the conditions of the reorganization. They even intimate that his suits, either intentionally or otherwise, will really result in benefit to the promoters of the trust if they delay individual suits by the bondholders until they are barred by the statute of limitations.

On this score Mr. Tatnall is indignantly silent and his counsel, A. H. Wintersteen, resents the imputation of his insincerity hotly.

The opposing attorneys for the non-assenting bondholders are proceeding with their cases as if Receiver Tatnall had not brought suits.

Should the receiver recover the $4,000,000 claimed to be due from the promoters, on profits realized by them, only such bondholders as proved their claims would share in the proceeds. This would mean that the non-assenting bondholders, by proving their claims, would get 3 per cent. of the total, or $120,000, which would be divided among them. In other words, they would then have received 14 per cent. of their full claims. The holders of the 97 per cent. of the bonds deposited with the re-organization committee, it is said, would have no claim, whatever, having surrendered all their rights to the committee. Had the court granted the independent bondholders the right to sue direct, Attorney Brown says they could no doubt have recovered $800,000 instead of a possible $120,000, through the receiver's action. Appeal from Judge Kirkpatrick's decision is in contemplation to secure if possible the right of the bondholders to sue.

In the matter of Receiver Tatnall's request for the court's advice as to suing out the $24,000,000 liabilities of the American Asphalt company's stock on account of non-assessment to its face value, it is stated that such suits could only be against holders of record, in other words, the National Asphalt company, from which not a cent could be obtained, or the holders of a few shares not converted into National bonds.

When Receiver Tatnall asked for the decree to bring the suits, Judge Kirkpatrick said: "This action by the receiver is entirely in acordance with the views this court has entertained from the beginning. Over a year ago Mr. Tatnall said to me that after all visible assets had been realized upon, action should be brought by him against the promoters and upon the assessment liability of Asphalt Company of America stock to make good, if possible, any deficiency remaining.

"I feel that the receiver is now pursuing the proper course and I feel it is the duty of this court to sign the order which is presented. Then if any of the opposing attorneys think later that the net has

allowed any of the big fish or little fish to escape, we shall try to fix it to catch all."

Asphalt Contracts in Philadelphia.

By William B. Bray.

The "Asphalt Trust," so-called, again receives the contracts this year for paving streets in Philadelphia, Pa., although the new municipal administration, headed by Mayor John Weaver, made an apparent effort to give the awards to lower bidders. The contracts involve an expenditure of $500,000.

The award was given for the bulk of the work to the Vulcanite Paving Company and to the Filbert Paving and Construction Company. The Vulcanite is the accredited representative of the "Asphalt Trust," and got the contract by virtue of a clause in the appropriation item of the city councils, providing that only Trinidad lake or Bermudez lake asphalt could be used. The two companies getting the awards this year are the only ones bidding on the specified kinds of asphalt.

The Vulcanite company received contracts for eighty-five streets, while the Filbert company got only two streets. All of the work is for original paving, and excepting intersections of streets, is paid for by property-owners abutting on the streets, at the rate of $2.60 per square yard, although the city pays the contractor only for the amount of his bid. The city rate is established so as to make a uniform charge all over the city for property-owners. The price to be paid the Vulcanite company this year by the city ranges from $2.15 to $2.22 per square yard, compared with $2.58 last year. The Filbert Construction Company this year bid $2 and $2.09 for the two streets awarded to them.

The only other bidder this year was W. S. P. Shields, representing Warner & Quinlan, who offered to pave seventeen streets with Trinidad asphalt, for a uniform price of $2.07, but as he could not furnish the lake asphalt, his bid was not considered. The Vulcanite company, however, although it was not mentioned in the specifications, put in a bid for Trinidad land asphalt also, for prices ranging from $1.79 to $1.92, in case there should be any possibility of a chance of a legal contention over the power of councils to limit the quality to lake asphalt.

The new mayor had been threatening to go into the asphalt paving question with a view of destroying the monopoly, but dicovered after six months of investigation that for the present he is powerless under councils' ordinance. He and the director of public works, however, said they would recommend in a few months that councils strike out the clause of limitation and throw the market open to all.

This clause has compelled Philadelphia to pay since 1899, prices ranging from $2.21 to $2.58 per square yard, while other cities, where competition was permitted, were getting the same article for prices ranging from $1.24 to $2.20. In 1898, when there was competition in Philadelphia, Trinidad lake asphalt was secured for $1.24 and Bermudez for $1.50. The following year the prices were forced up to $2.25 and $2.26, and have continued to rise ever since.

Camden, N. J., and Harrisburg, Pa., recently awarded contracts for the same material for less than $2.

The indications are that Philadelphia will soon be buying asphalt at prices comparing favorably with those paid in other cities.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal and State Reports—New Publications.

Municipal and State Reports.

Geological Survey of Michigan, vol. viii, Alfred C. Lane, State Geologist, Lansing, Mich.

This volume is of special economic value. Part i is a treatise on the clays and shales of Michigan, their properties and uses, by H. Ries, which, while not exhaustive, is quite extended in the field it covers. The first chapter considers the origin and properties of clay and the effect of various constituents upon it. The second chapter considers the use of clay in making various kinds of brick and pottery, cement, mineral paint and road material. The third chapter gives the methods of treating various kinds of clay and shale and the results of tests of many Michigan deposits, with estimates of the suitability of many of them for various purposes.

Part ii is on the mode of occurrence and quality of Michigan coal, by A. C. Lane.

Part iii is on marl and its application to the manufacture of Portland cement, by D. J. Hale and others, and is quite a full presentation of the standard methods of making cement of this and other materials in Michigan. Methods of occurrence of marl, methods of sampling and prospecting, and explanations of chemical analysis take one chapter. Theories of the origin of marl are fully discussed and illustrated.

One chapter is a record of field work, giving full accounts of the marl beds in use and the methods of obtaining the material. Many other deposits are also described. The chapter on the manufacture of Portland cement is historical and practical, giving descriptions of the various processes, the recovering of clay and marl, the necessary composition, effect of impurities, estimates of cost in detail for all items from power to packing. The chapter is fully illustrated and is a valuable exposition thereof.

The last chapter gives a list of localities in which cement is made, and of deposits of material and descriptions of mills are given whether they use limestone or marl as their calcareous ingredient. The locations are also listed by counties. Supplementary chapters on the development of properties and on testing cement are given by R. L. Humphrey.

The treatise covers 400 pages and is the most valuable work on the manufacture of cement from clay and limestone or marl which has yet appeared. This volume and a similar one by the geological survey of New York will long be the standards upon the general subject of cement materials and manufacture, though more detailed treatises upon particular subjects will doubtless appear.

Report of Streams Examination, chemic and bacteriologic, of the waters between Lake Michigan at Chicago and the Mississippi river at St. Louis, for the purpose of determining their condition and quality before and after the opening of the drainage channel. Arthur R. Reynolds, Commissioner of Health, Chicago.

Some abstracts from this report were published in our July number. The volume is a large one, 140 pages and 195 tables, each a full page, and gives in full the results of chemical and bacteriological analyses of the waters described in the title, in 1899 and 1900.

The tables give the results of the examinations of the water, chemically and bacteriologically, with data regarding hight of water, temperature and presence or absence of fecal bacteria, at Bridgeport and Lockport on the old Illinois and Michigan canal, Lockport and Joliet on the Des Plaines river, Wilmington on the Kankakee river, Morris, Ottawa, LaSalle, Henry, Averyville, Wesley City, Pekin, Havana, Beardstown, Kampsville and Grafton on the Illinois river, Ottawa on the Fox river, LaSalle on the Big Vermillion river, La Salle on the Illinois and Michigan canal, Chandlerville on the Sangamon river, Grafton, Alton, Chain of Rocks and Jefferson Barracks on the Mississippi river and West Alton on the Missouri river in 1899, before the sanitary canal was opened, the examinations being made by Palmer and Burrill of the University of Illinois. Other examinations by E. O. Jordan of the University of Chicago and Bisbee and Gehrmann of the Chicago municipal laboratory, cover similar territory with some additional in both 1899 and 1900,

before and after the drainage channel was opened.

These results are collected and represented graphically, and conclusions are drawn as reported above, in the written reports made by Commissioner Reynolds, A. Gehrmann, Profs. Jordan, Palmer and Burrill. The figures for volume of flow in the drainage channel are also given.

The practical disappearance of pollution by the time Peoria is reached and the equal disappearance of Peoria's pollution before the Mississippi river is reached are clearly shown. The report is well worth careful study as a statement of methods of examination and as some indication of the probabilities of self-purification of streams in similar condition. It is very unsafe, however, to assume similar effects when the conditions vary materially from those here observed.

Annual Report of the City Engineer, Cambridge, Mass., 1902.

This report is issued by James W. Pierce, the present city engineer, but is signed by L. M. Hastings, the city engineer last year. The principal work of the year seems to have been about 12,000 feet of sanitary sewers and 3,000 feet of storm water sewers constructed in the improved sewerage system, at a cost of $62,000, and about 1,500 feet of the Charles River parkway.

New Publications.

Anleitung fur die Verarbeitung und Verwendung von Portland Cement unter besonderer Berucksichtigung der Fabrikation von Cementwaren, Marmor, Mosaik, Terrazzo und Granito-Kunstarbeiten, Cementdachfalzziegel, sowie der Felsen und Grottenbauten. By Phil. Jacob Lucht. Second edition, 100 pp., paper. H Bechhold, Frankfort-on-the-Main.

As its title indicates, this is a handbook for the user of cement in making such special construction as steps, walks, floors, reservoirs, cisterns, cement wares of various forms, and in making mosaics, imitations and miniature reproductions of various buildings and objects of nature, tombstones, etc. It gives the proportions of materials to be used, the coloring matter, the methods of depositing and finishing and other details. Fire-proof mortar, water-tight mortar, methods of making stone of sand and lime, manufacture of cement tiles and Monier construction are also described. The official methods of testing cement adopted by the German Association of Cement Manufacturers and the Austrian Society of Engineers and Architects are given in full. The book should be valuable in its field and there is no single English book, large or small, corresponding to it in the nature of its contents.

Electric Lighting. A practical exposition of the art for the use of engineers, students and others interested in the installation or operation of electrical plants. Vol. II, Distributing System and Lamps. By Francis B. Crocker, E. M., Ph. D. 501 pp. Cloth, $3. D. Van Nostrand Company, New York.

Mr. Crocker's work is in two volumes, the first volume considering the generating plant and the second the distributing system and lamps. Together they give, perhaps, the most satisfactory consideration of the entire subject of the electric light, its production and distribution which is published. The volume at hand is the second edition of the second part above referred to and considers all the parts of electric lighting systems except the generating plants, to which the first volume is devoted. As text-books for engineering schools and hand-books for practical engineers they omit such detailed abstruse discussions as belong to books devoted more particularly to the theoretical consideration of the subject, the space thus saved being devoted to the description of practical details of construction and operation.

The physical properties of conductors with tables of constants and capacities take one chapter. One chapter is devoted to each of the series and parallel systems of electrical distribution, showing the various modifications of these systems and their adaptability to various conditions. with methods of computing sizes and capacities, current and power. The three-and five-wire and direct transformer systems of distribution have equally satisfactory treatment, and the methods of computing net works of electrical conductors are briefly considered. The alternating current has five chapters devoted to it, discussing the principles of alternating currents and of alternating polyphase currents, transformers, systems of distribution and calculation of circuits. Full detail is given and in such clear and concise form that these chapters are of very great practical value. The details of wire, poles and their treatment, insulators and other parts of overhead construction, with full set of specifications and equal detail regarding numerous forms of underground construction each take a chapter. Arc lamps take two chapters, interior wiring one, incandescent lamps one, other kinds of electric lamps one and meters one. All give the same satisfactory attention to details of principle, construction and op-

eration which are characteristic of the book. Appendices give the National Electric Code and the report of the committee of the American Institute of Electrical Engineers on standardization.

These books are practically indispensable to the worker in the electric lighting field and will be found very valuable by municipal and other officials interested in the operation of electric light plants and in the making of contracts per light where proper attention is to be paid to the character of the service and knowledge of what can be expected of the various systems is desired.

Ancient and Modern Engineering and the Isthmian Canal. By William H. Burr, M. Am. Soc. C. E., Professor of Civil Engineering in Columbia University. 488 pp. cloth, $3.50 net, postage 27 cents additional. John Wiley and Sons, New York.

The first remark by the casual observer of this book on the library shelves is regarding the rather disjointed title, and the reason for it is found on reading the introduction, which states that it is the outcome of a course of six lectures delivered at the Cooper Union early in 1902. The six parts of the book are the six lectures considerably expanded for publication, and beautifully illustrated by many photographs and reproductions of drawings.

The first part includes five chapters on ancient engineering, largely taken up with descriptions of Roman works after Frontinus and Vitruvius. Chaldea and Egypt fill the first chapter and Roman waterworks, sewers, harbors and foundations, the others, with some account of other noted aqueducts.

The second part is devoted to bridges. A chapter gives a short history of the development of bridge designs in this country. Seven chapters are devoted to the principles of the determination of strains in bridges and arches, and seem rather out of place in this book. They are strictly technical in their nature, while the remainder of the book is more popular in its style and much more general in its treatment.

Part three discusses waterworks for cities and towns and in its seven chapters shows the latest advances in the prevention of waste, the study of proper supplies and consumption, storage of waters, conduits and the flow in them, pumps, distribution systems, and purification.

Some features of railroad engineering are considered in the fourth part, including some peculiar problems of location, signalling and the locomotive in its three chapters.

As a member of the Isthmian Canal Commission, Prof. Burr is well qualified to speak concerning the two principal routes proposed, and in the fifth and sixth parts he gives the most comprehensive general accounts of the Nicaragua and Panama routes which have yet appeared. They are profusely and beautifully illustrated from photographs and are most interesting and instructive.

With the exception of the larger part of the section devoted to bridges, the book is of interest to those with engineering tendencies and the engineer himself will find it a collection of valuable general engineering data of the very latest date. It is not a well-organized whole, but is rather of the nature of a well-kept note book, mainly concerning modern engineering progress.

Palliser's Improved Form of Building Contract with Bond. 4 pp. 5 cents each, 100 for $2. Industrial Publication Co., 16 Thomas-st., New York.

This is a copyrighted form of standard building contract corrected to date, and should be very convenient for architects, builders and owners in states for which its provisions are suitable.

Proceedings of the Ninth Annual Convention of the American Society of Municipal Improvements, held at Rochester, N. Y., Oct. 7-9, 1902. 265 pp. paper. $1. George W. Tillson, Secretary, Municipal Building, Brooklyn, N. Y.

Most of the papers at the convention were printed in Municipal Engineering in November of last year, but this volume contains, in addition, the stenographic report of the discussions and should be on the shelves of every municipal engineer and director of public works. It should rather be there by virtue of their memberships in the society than by the payment of the dollar a copy, and they will find the total expense of membership, including expenses of attending the convention, to be money well invested. The next meeting will be held in Indianapolis late in October, 1903.

The Best Form of Rail for Street Railways. By E. W. Muenscher, M. Am. Soc. C. E., Manistee, Mich.

This is a reprint of a paper read by the author before the Michigan Engineering Society, and can be obtained from the author. It is an intelligent discussion of the subject and contains the opinions of many engineers upon the subject.

Trades Waste: Its Treatment and Utilization, with special reference to the prevention of river pollution. A handbook for borough engineers, surveyors, architects and analysts. By W. Naylor, A. M. Inst. C. E.; chief inspector of rivers, Ribble joint committee; consulting engineer on sanitation and rivers pollution to the Somerset county council and other public bodies. 21 plates, 27 diagrams and numerous other illustrations. 267 pp. cloth. J. B. Lippincott Company, Philadelphia, Pa.

That this book is a timely contribution to engineering literature, in this country at least, is shown by the increasing number of inquiries for information upon its subject. Heretofore the data and reports upon installations of plants have been obtainable only after searching through many reports and books. This is their first collection into one publication. And, while some very successful plants for certain classes of trades waste are described, it will be found, upon reading this book, that some materials have not yet yielded to treatment at a cost commercially possible, and are still waiting for the successful experimenter.

The author's positions, as outlined above, give him special familiarity with what has been done by others, and have led to the devising of some methods of his own. In each case treated some account of the trades operations is given, enough to show the amount and character of wastes to be treated, and descriptions are given of the various attempts to treat these wastes, with the author's judgment as to their success or failure. He quotes freely from his own reports upon special cases and from reports and papers by others giving descriptions of their plants and their experiments, thus giving the clearest and most favorable accounts possible. Such detail is given in the review of the book as is advisable in view of its importance.

The application is to English conditions which have been in the past much more serious than our own, but it must now be made to American conditions in yearly increasing extent.

The introduction states the position of the River Pollution Commission, and the conditions which it has been and is necessary to relieve. The second chapter is entitled "Chemical Engineering" and discusses sedimentation, chemical precipitation, apparatus and plants for applying it to various classes of liquids, the engineering principles of their construction, the disposal of sludge and apparatus for the purpose, air compressors, sludge and sewage pumps, the principles of filtration and apparatus of various kinds for efficient filtration of trades waste, including in particular the "sprinkler" system of "continuous intermittent" filtration which seems, in the author's opinion, to meet the conditions where filtration can be applied, in the most satisfactory manner of any apparatus in use.

Precipitation with chemicals suited to the composition of the liquid and septic tank treatment, often with the necessary addition of house sewage fresh or partially decomposed, seem to be the most generally successful methods, and one or the other is usually recommended, as detailed in the following chapters.

The wastes from the washing of wool seem to be best treated by the precipitation method, and the author describes a number of operations which recover material of sufficient value to pay at least a part of the cost of purifying the factory effluent sufficiently to make it practically innocuous when discharged into the ordinary stream.

In the chapter devoted to tanning it is shown that the ordinary septic tank and filters give the best treatment to the wastes and makes it evident that, so far as efficacy of treatment is concerned, at least, it can be applied either at the tannery or at the sewer outlet with the other sewage discharged from the sewer system.

The difficulty in purification of brewery and distillery wastes in connection with house sewage arises from the souring of the waters before they reach the purification plant. The author recommends treatment of the wastes at the moment of discharge from the plant in "anti-souring" tanks, which are simply septic tanks primed with bacteria which will prevent the fermentation and set up the ordinary putrefaction which takes place in the septic tank. The admission of a proportion of house sewage to the anti-souring tanks or occasional dosing with putrid sewage keeps the tanks in working order. The effluent can be discharged into the sewers or filtered before discharge into a water course, if necessary. Sprinkling filter installations and their results are described in considerable detail.

The waste from calico bleaching and dyeing seems to require some treatment preliminary to that of the "anti-souring tank" method above described.

The treatment of the refuse liquids from dyeing and calico printing is also a rather complicated process and is considered in detail, with suggestions of modifications in many existing methods.

The question of paper mill refuse it also

difficult of solution, and it is stated that no complete solution has yet been offered. Partial results more or less satisfactory are obtained by the methods described.

A chapter is devoted to the special treatment of the liquor from gas works, the refuse from soap factories, from alkali works using various processes, and the drainage from mines and coal-washing plants.

Recovery of the original chemicals used, the saving of by-products and the unproductive purification necessary to remove the nuisance produced by the polluted discharge are all fully considered in each case, and the important question of cost and its effect upon the industry is always foremost, making the book a practical guide to proper purification of trade effluents, though its processes may seem expensive to manufacturers who have heretofore been permitted to discharge their unpurified effluent into streams. The trade wastes considered are said to represent all the most common wastes so that the processes described may be applied with more or less modification in detail to any effluents not specifically considered in the book.

As the first English book of its kind, and on account of the special opportunities of the author to secure full and accurate knowledge upon the subject, the book should have a ready sale in this country as well as in England and will be found of great value to engineers and officials contending with stream pollution as well as to manufacturers who are called upon to improve the condition in which wastes leave their plants.

The Civil Engineer's Pocket Book. By John C. Trautwine, C. E. Revised by John C. Trautwine, jr., and John C. Trautwine, 3d. Eighteenth edition. 70th thousand. 1,079 pp., cloth $5. John Wiley & Sons, New York.

A complete description of this book is not necessary, engineers generally being so well acquainted with it. The space available will therefore be devoted to the new matter and the changes made or not made

The section on arithmetic is considerably extended, including additions of tables of interest, annuities, depreciation, etc. The subject of logarithms for the first time has any considerable attention and now occupies about twenty-five pages, including a logarithmic chart, the slide rule and a new table of five-place logarithms, arranged to make the differences always between 20 and 60. This gives the logarithm of each number from 1,000 to 1,750, of each second number from 1,750 to 3,750, and of each fifth number to 10,000. It is doubtful if the saving in space and the uniformity of the differences will offset the regularity of tables like Jones's or Webb's in the minds of many engineers. Natural circular functions are given to seven figures, but their logarithms do not appear.

The changes in the section on surveying are in the articles on chaining, location of the meridian, and the new table of azimuths of polaris. Four pages on rain and snow fall are added. Under hyhraulics the additions include the Venturi and Ferris-Pitot meters, the miner's inch, water consumption in cities and cost of water pipe and laying in Philadelphia. The section on resistance of curves in pipe is rewritten according to the latest experiments.

Much of the article on statics has been rewritten, especially the portion regarding beams and trusses, and brought down to date, with modern examples.

A very valuable addition is a full set of conversion tables of weights and measures and coins. Digests of specifications for bridges and buildings, and for iron and steel, price lists of manufactured articles, a business directory and a short engineering bibliography are also new features. The price lists, like the old tables of cost of earth work and the new one of water pipe laying must be kept up to date in the successive editions of the work The utmost care in this regard is not always taken in this book.

The sections on rolling stock, shapes of steel, cement, concrete and timber preservation have been rewritten

Perhaps the most pleasing improvement in the book is the rearrangement of the matter according to a more definite plan than has heretofore been used, so that related subjects are now more closely connected and are easier to find. The index has been made over to suit the new order and the consecutive paging, but is not perfect, an occasional bit of information being found only because it is now in its proper relation to other information on the same subject. An absolutely complete index of so comprehensive a book would, however, be somewhat unwieldly.

ORGANIZATIONS AND INDIVIDUALS

The Minnesota Municipal and Commercial League—Convention of the League of American Municipalities—Technical Meetings.

The Minnesota Municipal and Commercial League.

The Minnesota Municipal and Commercial league was organized at a convention in St. Paul in the spring, composed of about seventy-five delegates from thirty-five municipalities of the state. The constitution states that the objects of the society are the study and promotion of public questions, particularly in relation to municipal administration, transportation charges and freight rates, general taxation and legislation. The secretary is required to establish and maintain a bureau of information for the purpose of gathering and compiling information.

The league was proposed by the Commercial club of Cannon Falls, Minn., and Mr. L. A. Rosing of that city is very properly the first president of the organization. He is also the acting secretary. Other officers are J. A. Eckstein, vice-president, New Ulm, and J. Esbjornsson, treasurer, Litchfield. The executive committee is made up of the chairmen of the various committees, the titles of which will show the scope of the inquiries and discussions to be made by the society. They are J. G. Armson, Stillwater, of the committee on municipal charters; C. N. Andrews, Mankato, on public service, corporations and municipal ownership; C. W. Gress, Cannon Falls, on railroad rates and transportation; Carlos Avery, Hutchinson, on streets, alleys and boulevards; C. O. Cooley, Madelia, on health and sanitation; D. C. Armstrong, Albert Lea, on parks and playgrounds; W. C. Webber, Rochester, on taxes and insurance.

The president calls attention to the fact that the objects and purposes of the league are really twofold, one section taking up questions of strictly municipal interest, such as encouraging cities and villages in laying out parks and playgrounds, study of street building, proper width of roadways and boulevards, general beautifying of municipalities, electric lighting, municipal ownership of lighting and water plants, another section considering matters of business interest such as railroad rates and transportation, taxes and insurance.

The first annual meeting will be held in St. Paul probably in January, 1904.

Minnesota has many small cities and towns of approximately the same size and but few large cities. A society of this kind should be more than usually successful in that state and its benefits more widely spread because nearly all the cities are interested in the same questions in about the same way and nearly all are in the same conditions as to funds and competence of employes and officials, so that the subjects for discussion can be so selected as to be interesting to every member all the time. The successful development of the society is confidently predicted.

Convention of the League of American Municipalities.

The seventh annual convention of the League of American Municipalities will be held at Baltimore, Md., October 7th, 8th and 9th, 1903. The program, so far as arranged, is as follows:

"The Advantage of Municipal Construction Over the Contract System," Hon. James M. Head, Mayor of Nashville, Tenn.

"Municipal Ownership of Public Utilities," Hon. James A. Reed, mayor, Kansas City, Mo.

"The Initiative and Referendum," by Mr. George Shibley, chairman National Federation of Majority Rule, Washington, D. C. The question of the referendum has come to be considered more than a mere theoretical reform. Its practical operation in San Francisco and Seattle and its direct connection with the recent measure passed by the Illinois legislature providing for municipal ownership of Chicago's street railways makes it a question of more than ordinary interest. Mr. Shibley has studied this question from the practical standpoint.

"The Operation of a Municipal Asphalt Plant," by Hon. John Arbuthnot, mayor, Winnipeg, Canada.

"Organized Labor and the Municipality," by Hon. Ignatius A. Sullivan, mayor, Hartford, Conn.

"Water Waste," by Mr. E. W. Bemis,

superintendent of water works, Cleveland, O. Since his appointment as superintendent of water works by Mayor Tom Johnson, Mr. Bemis has been in a position to give direct attention to the subject assigned to him.

"Municipal Telephone Exchanges," by Mr. J. F. Hemenway, New York City. Mr. Hemenway is secretary and treasurer of the Ericsson Telephone company, and is well posted upon the subject assigned to him. He will give facts relative to municipal ownership of telephones in Europe, and the progress in this direction in America.

"Paving," by Mr. A. W. Dow, Ph. B., Washington, D. C. Mr. Dow is a chemical engineer and inspector of asphalt and cements for the District of Columbia. Mr. Dow is a high authority in his profession, and will handle this subject in a practical manner, endeavoring to show how cities may obtain good pavements at reasonable price, and will point out the lack of attention given to this branch of municipal engineering by the majority of municipalities.

"Municipal Statistics," by Mr. Hugo S. Grosser, Chicago, Ill. Mr. Grosser is librarian and statistician for the city of Chicago. But three cities in the United States, viz.: Chicago, Boston and New York, support a statistical department.

"Municipal Restriction of the Social Evil," by Mayor Julius Fleischmann, Mayor of Cincinnati.

While the question of municipal ownership has received general attention in the League meetings, it is the expressed policy of the League to refrain from taking sides for or against the proposition generally. An effort will be made to have the opposition to municipal ownership represented upon the program. To this end, Mr. Ernest H. Davis of Williamsport, Pa., newly elected secretary of the National Electric Light Association, has been invited to take a place upon the program, and it is probable he will accept the invitation, discussing municipal ownership of lighting plants from the standpoint of the private companies.

A number of other speakers will be on the program discussing the subjects already named, and also covering other subjects.

Baltimore was selected as the place to hold the seventh annual convention of the League because of the efforts of ex-Mayor Hayes. Robert M. McLane, the newly elected mayor, has given assurances to the executive committee of the League that he will interest himself in every way possible to make the convention a success from every standpoint.

Our editorial department considers some features of the meeting, to which reference may be made.

Technical Meetings.

The West Virginia Good Roads' state convention was held in Morgantown, W. Va., July 10 and 11.

The seventh annual convention of the American Park and Outdoor Art Association was held in Buffalo July 7, 8 and 9. Officers for the ensuing year were elected as follows: President, Clinton Rogers Woodruff; vice-president, John C. Olmstead; Mrs. Herman J. Hall, Charles W. Garfield, Warren H. Manning, Dick J. Crosby, W. Orriston Roy; secretary, Charles Mulford Robinson; treasurer, Ossian C. Simonds.

The sixth annual convention of the New England Association of Park Superintendents was held at Albany, N. Y., June 23, 24 and 25. Officers for the ensuing year were elected as follows: President, G. A. Parker, Hartford, Conn.; secretary, J. W. Duncan, Boston; treasurer, J. D. Hemingway, Worcester, Mass.

Several interesting features are promised for the forthcoming convention of the International Association of Municipal Electricians at Atlantic City in September. Among them are an exhibit of the Cooper-Hewett mercury vapor lamp and converter, which have lately been perfected and a demonstration of the Deforest system of wireless telegraphy.

The seventh annual convention of the Central States Water Works Association will be held at Dayton, O., Sept. 15, 16 and 17. Secretary William Allen Veach, Newark, O., has issued a circular regarding the live subjects for discussion at the meeting, calling attention particularly to the provisions of the new Ohio municipal code regarding water works, and the advantages to water boards and superintendents of membership in and attendance of the meetings of the society. Dayton is an excellent location for such a meeting, and this association is doing constantly better work so that membership in it is becoming each year more valuable.

The Inter-State Builders' Supply Association, now the National Builders' Supply Association, will meet in Detroit, Mich., Aug. 4 and 5. The headquarters will be at the Cadillac hotel. The executive committee will meet at 9 a. m., Aug. 4, and the first general meeting is called for 2 p. m. of the same day. Papers will be read during the sessions of Tuesday and Wednesday by Robert W. Lesley of

Philadelphia on "Cement;" by George W. Hotchkiss, secretary of the Illinois Lumber Dealers' Association, Chicago, on "Associations and Their Benefits;" by F. M. Smith or J. J. Edgerly of the Lumber Dealers' Association, on "Demurrage and Car Service Associations," by Gordon Willis of St. Louis, vice-president of the association, and others. A pleasing program of entertainment has also been arranged.

The sixth annual convention of the League of Michigan Municipalities was held at Adrian, Mich., on June 16 and 17. Representatives were present from twelve cities and villages of the state, including Detroit, Battle Creek, Jackson, Ann Arbor, Ionia, Adrian, Wyandotte Owosso, Three Rivers, Hudson, Palmyra and Monroe. Addresses were made by Hon. Willard Stearns of Adrian on "Juvenile Offenders Against City Ordinances;" by Dr. J. C. Johnson of Adrian on "Public Health;" by F. F. Ingram of Detroit on "Municipal Lighting Plants," and by Hon. Thos. E. Barkworth of Jackson on "Municipal Ownership of Our Public Utilities." These papers and other questions affecting municipal administration were informally discussed by the other representatives.

It was decided to hold the next annual session at Ann Arbor as a joint convention with the Michigan Political Science Association. The following officers were elected for the coming year: President, John F. Bible of Ionia; vice-president, Wm. F. Moeller of Detroit; secretary and treasurer, John A. Fairlie of Ann Arbor; trustees, F. F. Ingram of Detroit, E. R. Nellis of Wyandotte, G. W. Detwiler of Owosso, J. N. Sampson of Adrian and George H. Phillips of Battle Creek.

Personal Notes.

T. V. Greib has been appointed city engineer at Carthage, Mo.

L. H. Stone has been appointed assistant city engineer at Des Moines, Ia.

Jacob Laird has resigned his position as city engineer of Mansfield, O.

F. A. Delavan has been appointed assistant city engineer at Rochester, N. Y.

W. H. Maybury has been appointed commissioner of public works at Deroit, Mich.

William R. Hill has resigned as chief engineer of the aqueduct commission of New York City.

Joseph W. Hunter, Jenkintown, Pa., has been appointed state highway commissioner of Pennsylvania.

George S. Morison, past president of the American Society of Civil Engineers, died in New York City, July 1.

C. A. Snow, who has been city engineer at Elyria, O., for sixteen years, has resigned and is succeeded by G. A. LaGron.

W. F. Walling has been appointed inspector in the sewer division of the engineering department of the District of Columbia.

Howard B. Bunn has been appointed clerk and superintendent of the board of water commissioners at Rahway, N. J., to succeed James H. Lym, resigned.

L. T. Haney, Jun. Am. Soc. C. E., has accepted a position with Wood, Harmon & Co. as resident engineer, with offices at Church and Utica-aves., Brooklyn, N. Y.

Edgar B. Kay, instructor in the College of Civil Engineering, Cornell University, has been appointed professor of civil engineering at the University of Alabama, Tuscaloosa, Ala.

Walter C. Powell has resigned as chief engineer of the pumping department of the water works at Springfield, O., which position he held for twenty-one years. William Blasier was appointed to succeed him.

James Wilkinson, superintendent of the Washington Gas Light company, Washington, D. C., died July 4, at the Columbian university hospital, where he had been taken several weeks before for treatment.

Thomas Chalmers of the Allis-Chalmers Company died in Chicago July 13, aged eighty-seven years. He was one of the founders of the Fraser & Chalmers company in 1871. He retired from active business two years ago.

T. H. McCann, M. Am. Soc. C. E., and R. Beyer have formed a partnership as Thos. H. McCann & Richard Beyer, civil engineers and surveyors, to succeed Thomas H. McCann, Second National Bank building, Hoboken, N. J., and 45 Cedar-st., New York City.

Lindsay Duncan has resigned his position as instructor at the College of Civil Engineering, Cornell University and accepted a position as professor of civil engineering, University of Colorado, Boulder, Colo.

Mr. Geo. H. Gibson has resigned as manager of the advertising and publication department of the B. F. Sturtevant Company of Boston, Mass., to accept an appointment with the International Steam Pump Company, having offices at 114-118 Liberty-st., New York City. Mr. Gibson was formerly connected with the Westinghouse Companies' publishing department of Pittsburg, Pa., and was for two years a member of the editorial staff of the Engineering News of New York City.

MACHINERY AND TRADE

Advantages Claimed for Creosoted Wood Block Pavements.

The chief points for consideration in the paving question are to secure a pavement that is not affected by changes of the weather or variations in temperature; that is durable, reasonable in price at first cost; that is sanitary and easily cleaned; that gives least resistance to traction; that affords greatest security to traffic in the elimination, as far as possible, of accidents caused by uneven, defective or slippery pavements. Opinion differs somewhat as to the relative importance of these considerations.

Several American cities have conducted some expensive experiments in paving problems and some of the most eminent authorities, both at home and abroad, have, after careful investigation and extended comparisons, expressed their firm conviction that, from all considerations, there is no pavement now laid that equals the creosoted wood block pavements. There are many reports of tests and investigations by competent engineers and experts showing the durability of creosoted wood block pavements to exceed that of any other paving material except granite

Creosoted wood block pavements are not affected by variations in temperature. The durability of these pavements is conclusively shown in their continued use for

CREODONE WOOD BLOCK PAVEMENT, MINNEAPOLIS, MINN.
Tenth Street, South, at corner Third Avenue.

many years on some of the heaviest trafficked streets of European cities. The Rue de Rivoli, Paris, over which pass 42,035 vehicles per day, is paved with creosoted wood blocks; so also is King William-st., London, with its 26,793 vehicles per day. In Liverpool it has been shown that creosoted wood blocks in a street subjected to a traffic amounting to 302,000 tons per yard width per annum have withstood this enormous traffic for twenty years. There is no street in any American city that is subjected to such severe tests. There are but few having a traffic amounting to 12,000 vehicles per day. One of these reaching this mark is Rush-st., Chicago, at the bridge connecting the north and south divisions of that city. In November, 1899, for the purpose of testing wood block pavements treated with kreodone, one-half of this bridge was paved with blocks so treated and the other half with blocks not treated. The test proved satisfactory in every respect to the city authorities, as shown in Mayor Harrison's annual message to the council recently quoted in this department. The assistant city engineer reported that while the untreated blocks had worn unevenly and showed a wear of two inches, the blocks treated with kreodone had worn evenly and showed an average wear of one-eighth of an inch. In New Orleans blocks treated with common creosote oil taken from a pavement after twenty-four years' use showed a wear of only one-half inch. In the light of these severe tests the claims seem reasonable that, for all ordinary traffic a creosoted wood block pavement is practically indestructible from wear.

Pavements are now being laid in many American cities of long leaf yellow pine blocks treated with kreodone, the same as were used in the Rush-st. bridge in Chicago. The cut herewith shows a kreodone pavement on Tenth-st., Minneapolis, Minn. Like the creosote oil of commerce, kreodone is an oil of tar, but unlike the common creosote oil it is non-volatile and therefore is a permanent preservative. A block treated with it and subjected to no wear would never decay and would retain its strength indefinitely. In other words, blocks treated with kreodone and not laid in a pavement for twenty years would stand the same wear and traffic as blocks treated with kreodone and laid immediately. It has been demonstrated that if a block of sound, well-seasoned yellow pine be submitted to alternate hammer blows with a block of granite of like size the wood will be in good condition when the granite has been pounded into dust. Treating the block with the non-volatile kreodone preserves in it for an indefinite time this power to resist wear. Kreodone is produced by the Republic Chemical and Creosoting Company of Indianapolis, Ind.

The Winget Concrete Block Machine.

The Winget building block machine, sold by A. D. Mackey & Co., 404 Chamber of Commerce, Chicago, Ill., is one of the latest additions to this new and increasingly popular class of machinery. It has sides and ends which are moved into place on hinges so designed that they are forced positively and accurately into position, making clean sharp corners to the blocks. The cores are moved up into position and down when block is formed, the motions of side and end plates and cores being made by revolving gear attachments avoiding jar. The cores and plates may be changed for any form or design of face or hollow, and the cores may be entirely removed. A facing of half or three-quarters inch of extra strong concrete can be put on a block by means of an ingenious adjustment. It is claimed that four men with one machine can make 150 blocks in ten hours. Sizes range from 8 to 16-inch wall in thickness, height is 9 inches and length 32 inches. Openings for joists are placed 16 inches apart, so that a continuous column of solid block is below them. Flues are clean and straight and can be used for smoke or ventilation, pipes, wires or speaking tubes. The usual favorable comparisons of cost as compared with brick and stone masonry can be made.

Misleading Photographs of a Street in Rome, N. Y.

An injunction has been granted against the Barber Asphalt Paving company and George G. Gifford to prevent the repetition of an occurrence of July 10, and asking $100 damages. It appears from the affidavits that on that date Mr. Gifford with a photographer went at the request of Mr. Graham of the Barber company to a point on N. James-st. in Rome, N. Y., which has recently been paved with Warren's Bitulithic pavement, and dug several holes in the pavement, thus giving the pavement the appearance of being badly cut up by the calks of horses' shoes, and then took photographs of the pavement.

The foreman of Warren Brothers Company was obliged to take a gang of men,

some stone screenings and a steam roller to repair the damage thus done. The company which laid the pavement demands protection from the misrepresentation of such deceiving photographs, and reimbursement for the expense of making the repair.

Repair Asphalt Streets in Time.

The Kirchner Construction Company of Cincinnati, O., have engaged Mr. F. O. Blake to repair Spring Grove-ave. with one of his economic asphalt surface heaters. Mr. Blake has just completed several weeks of work in Indianapolis not extended on account of lack of city repair funds and his work in Cincinnati is reported to be equally satisfactory. The machine can be applied to the repair of streets which have formed into waves, in the manner so common when asphalt streets begin to deteriorate rapidly, and by smoothing these out and restoring the original surface, by the addition of new material if necessary, the actual breakage of the asphalt surface and consequent disintegration and disappearance of the same is prevented. Actual breaks are repaired with equal ease. The cost of repairs actually made per yard is reduced very much and the amount of repair per year is also diminished.

Trade Publications.

Mining Machinery Catalogue No. 19 of the Jeffrey Manufacturing Co., Columbus, O., has just been issued. Coal cutters and drills, electric locomotives and power plants, conveyors, screens and crushers are handsomely illustrated and described.

The Universal steam rollers and the "porcupine" for macadam road maintenance and their work are shown in detail in a new catalogue issued by Julian Scholl & Co., 126 Liberty-st., New York.

The filtration works of the East Jersey Water Company, Little Falls, N. J., are described and illustrated in a pamphlet issued by the New York Continental Jewell Filtration Company.

TRADE NOTES.

ASPHALT.

The Southwestern Paving and Construction Company, Little Rock, Ark., has been incorporated to mine and sell asphalt and to construct asphalt sidewalks and streets. The officers of the company are: President, J. A. Woodson; vice-president, Allen N. Johnson; secretary and treasurer, P. B. Price.

The International Asphalt Company, Salt Lake City, Utah, has incorporated with officers as follows: President, W. H. Innes, Boise City, Idaho; vice-president, R. W. Schuttler, Salt Lake City; treasurer, Truman Schenck, Salt Lake City. The company has acquired 480 acres of land on Willow creek, Grand county, where, it is stated, 6,000,000 tons of asphaltum are available. A contract for a 100-ton refinery has been let to A. T. Davis of Berkeley, Cal., the erection of which will begin early in August.

The Warren Brothers Company of West Virginia and Detroit, Mich., has filed its incorporation papers in Michigan to engage in paving, roofing, etc.

The Nebraska Bitulithic Company, Omaha, Neb., has been incorporated to manufacture roofing and paving material by John Grant, Ellery Westerfield, W. H. Herbert, Chas. Potter and Chas. Van Camp of Omaha.

The organization of a rock asphalt paving company is proposed at Grand Rapids, Mich., by local men and outside capitalists whose names have not yet been made public. The organization of the company is in the hands of Attorney Orley C. Granger.

BRICK.

H. G. Beard, J. M. Remington, C. W. Kerfoot and W. J. Estes are at the head of a company to establish a large paving brick plant at Shawnee, Okla.

The plant of the Cloverport Paving Brick Company, Cloverport, Ky., has been purchased by A. H. and C. R. Murray, J. Broh and C. A. Crary of Huntington, W. Va., and Lewis Hausbach of Parkersburg, W. Va., who will convert it into a roofing tile plant.

The old Capital City brick and pipe plant in South Des Moines, Ia., recently purchased by the Barber Asphalt Paving Company, was damaged by fire July 3, entailing a loss of $40,000. The company will rebuild at once.

A company is being organized at Des Moines, Ia., by F. B. Huckstep to manufacture brick by a chemical process, using the waste product of coal mines. Tile brick for floors and fancy paving blocks for private driveways will be a specialty.

Ralph C. Ely, president of the Utica Pressed Brick Company, and E. Arthur W. Jeffries of Utica, N. Y., have secured valuable clay deposits about ten miles north of Oneida and will erect a plant for the manufacture of bricks of a high grade and other products. It is believed that the clay will make superior paving blocks. The officers of the company are: President, Ralph C. Ely, New York City; vice-president, John E. Hardman, Montreal; secretary and treasurer, H. Ward Wright, New York City.

Valuable deposits of marl have been dis-

covered along the Maple river at Brutus, north of Petoskey, Mich.

The large plant of the Great Northern Portland Cement Company at Baldwin, Mich., is completed and the manufacture of cement begun.

A company has been organized under the laws of the state of Delaware to build a cement plant at Louisiana, Mo., with officers as follows: President, Charles S. Harmon, Chicago; vice-president, John F. Palmer, Chicago; treasurer, I. C. Elston, Crawfordsville, Ind.; secretary, George W. De Smet, Chicago; general superintendent, R. C. Carpenter, Ithaca, N. Y. The company has purchased over 1,000 acres of land south of Louisiana and work on the plant will begin at once.

J. W. Crisman and others of Toledo, O., are interested in the recent discovery of deposits of marl in South Monterey, four miles north of Allegan, Mich. Tests of the marl show it to be of the best and to possess great tensile strength. A company will probably be formed to establish a cement plant.

The American Cement Company has announced a new subsidiary company to be known as the Seaboard Cement Company of Norfolk, Va., which has been capitalized at $1,300,000.

The Pennsylvania Portland Cement Company, New Castle, Pa., has been organized by George Greer, E. T. Norris, E. H. Ohl, Charles Greer and E. I. Phillips. A large cement manufacturing plant will be erected within a year. George Greer, prest.

The El Ca Jon Portland Cement Company has been incorporated and will erect a plant near Alpena, Mich. The officers of the company are: President, R. R. Metheany, Grand Rapids, Mich.; vice-president, William Mishler, Detroit; second vice-president, Harry Nichols, Charlevoix, Mich.; treasurer, E. E. Perrin, Detroit.

The St. Mary's Portland Cement Company, Ltd., St. Marys, Ont., has been incorporated with officers as follows: President, J. J. Crabbe; vice-president, J. J. Main and Thomas Bryce; secretary-treasurer, Ambrose Kent, 5 Richmond-st., West Toronto.

The Redfield Cement, Brick and Tile Company, Redfield, S. D., has been incorporated.

The Mississippi Valley Cement Company, New York City, has been incorporated by James G. Gregg, John H. Servis and U. Grant Glackford of New York City.

The Osborn Engineering Company Cleveland, O., has been engaged to make plans for increasing the capacity of the plant of the Crescent Portland Cement Company, Wampum, Pa.

A Portland Cement plant is contemplated at Swan Lake, three miles east of Portage, Wis., where C. C. Wayland has found 700 acres of marl.

A large cement plant will be located at Independence, Kas. W. F. Cowham is interested.

The Manitoba Cement Company has decided upon Morden, Man., as a site for the new mills and building operations will begin soon. The company expects to be in operation by 1905.

The Devonian Gas Company, Jersey City, N. J., has been incorporated by W. Monds Greene, Frank A. Van Winkle and Clarence F. Walker, to establish and operate gas plants.

The International Construction Company, Detroit, Mich., has been incorporated to build and construct electric light, railway and power plants, canals, public works and steam railways.

The McKenney & Waterbury Company, Augusta, Me., has been incorporated to deal in gas and electric light fixtures. The promoters of the company are Wm. A. McKenney and Frank S. Waterbury, Brookline, Mass.; John J. Tobin, Boston; Geo. F. Fuller, Winthrop, Mass.; Thos. J. Lynch, Melvin, S. Holway, S. H. Leary and Chas. H. Daily, Augusta.

MISCELLANEOUS.

The Memphis Bridge Company, Memphis, Tenn., has been incorporated by Robert L. Owens, George L. Austin, Frank E. Wright, C. I. Harlan and W. M. Hewitt.

The Delphos Construction Company and the Ohio River Construction Company, Jersey City, N. J., have been incorporated to conduct a general construction and engineering business by George S. Clay, R. A. Benedict and Richard J. O'Neill.

The Artificial Stone Company, Charleston, Ill., has been incorporated to manufacture concrete fence posts by J. A. Mitchell, J. C. Brooks and C. W. Brooms.

A company will probably be formed at Mitchell, S. D., to engage in the manufacture of cement blocks.

The Coughlan Cement and Construction Company, Mankato, Minn., has been organized to manufacture and lay sidewalk blocks, etc., by T. R. Coughlan and James Spellman.

The Chicago Concrete Construction Company, Chicago, Ill., has been incorporated to build and construct cement walks, floors, curbing, etc., by Philip Lauth, Christian Irvison and Edgar W Chesterman.

The Charles Ross & Son Company, 16 Steuben-st., Brooklyn, is about to erect a large building 86 by 28 ft. for a machine shop in which there will be considerable cement floor and foundation for piers.

The United States Sanitary Company, 485-87 Missouri-ave., N. W., Washington, D. C., has delivered to the war department for shipment abroad fifty more odorless steel sanitary dump carts, making several hundred that department has purchased of the company.

The Lancaster Concrete Block and Paving Company, Lancaster, O., has elected officers as follows. President, Aaron Burgner; vice-president, George W. Moss; secretary-treasurer, O. A. Wheaton.

The St. Louis Street Flushing Machine company, St. Louis, Mo., has been incorporated to manufacture, vend, let and operate street sprinkling, cleaning and flushing machines by William Ratican, Stephen J. Ratican and James C. Wilson.

The Wilmington Stone and Construction Company, Charlotte, N. C., has been incorporated to manufacture hollow concrete building blocks after the Palmer patents. The officers of the company are: President, Maj. William F. Robertson; vice-president, Col. Walter Taylor; general manager, S. P. Adams; secretary-treasurer, H. E. Bonetz.

The Wakeman Stone and Construction Company, Augusta, Me., has been incorporated to conduct a general quarrying and gas business with officers as follows: President, J. Berry, Augusta; treasurer, A. M. French, Winthrop, Me.

The Pittsburg Meter Company, East Pittsburg, Pa., is constructing an addition to its plant.

The city of Elgin, Ill., has entered into a contract, with privilege of purchasing a universal ten ton steam road roller, with Julian Scholl & Co., of New York City.

The Friction Heat and Boiler Company, Jersey City, N. J., has been incorporated by Jas. W. Boyd, E. D. McAllister, John F. Imel, L. R. Lach, B. W. Mosman, W. H. Dolopp, R. M. Nash, Chas. S. L. Baker, W. H. Sherman and Melvin Pomerene, all of St. Joseph, Mo.

A meeting of the creditors of Jason H. Shepard, individually, and as a member of the firm of Dolese & Shepard of Chicago, which was duly adjudicated bankrupt on July 15, will be held at room 637 Monadnock Block, at 9:30 a. m. Aug. 5, at which time creditors may attend, prove their claims, appoint a trustee, examine the bankrupt and transact such other business as may properly come before the meeting. Frank L. Wean, referee in bankruptcy.

A new firm in the field is the American Road Roller Company of 156 Fifth-ave. New York, and Groton, N. Y. This company has purchased the steam road roller and machinery business long carried on by Wm. C. Ostler in New York and the new plant of the Conger Manufacturing Company at Groton, N. Y., and can now furnish steam road rollers, traction engines and combinations of the two as well as street sweepers and scrapers, push carts, gasoline engines, etc.

Recent Inventions.

719,733. Feb. 3, 1903. Scavengering Machine. James Briggs, Idle, England. Vehicle with revolving broom behind and endless carrier for elevating sweepings to dump in box on vehicle.

719,892. Feb. 3, 1903. Fire-proof Floor and Ceiling Construction. John T. Simpson and Marshall N. Shoemaker, Newark, N. J., assignors to American Concrete-Steel Company, Newark, N. J. Combination with floor beams and girders of main supporting metal bars, clips connecting diagonal rods and also wires passing down about the beams and girders and reinforcements suspended beneath, all adapted to support concrete and a suspended fire-proof ceiling.

12,077 (Reissue). Feb. 3, 1903. Method of Repairing American Asphalt Pavements. The United States Repair and Guaranty company, Chicago, assignee of Amos H. Perkins, deceased. The well-known Perkins heater method.

720,165. Feb. 10, 1903. Monolithic Construction. W. C. Lynn, Hyattsville, Md., and Kort Berle, Washington, D. C. Recesses in building walls for support of concrete-steel beams flaring at bottom to support ceiling slabs of concrete-steel laid immediately; shaped connecting rods to floor laid above also of concrete-steel, finished with surface containing nailing slats if desired.

720,208. Feb. 10, 1903. Mechanism for Removing Ice and Snow from the Conducting or Third Rail of Electric Railways. F. V. Winters, New York, N. Y. Horizontal arms with crushing wheel journaled on their free ends and spring pressing it down on the rail.

720,290. Feb. 10, 1903. Catch-basin. Lewis S. Kaife, Montreal, Can. Upper section having inlet and a deflector, middle section plain and of any desired length, lower section with outlet to sewer and trap over it.

720,306. Feb. 10, 1903. Globe-holder for Arc Lamps, etc. James J. Ward, Ft. Wayne, Ind. Pendent holder receiving neck of globe, loosely fitting, and springs for yieldingly transmitting the supporting pressure.

720,312. Feb. 10, 1903. Electric Arc Lamp. Henry Baggett, London, Eng. Feed clutch for carbons of electric light and means for moving it.

720,384. Feb. 10, 1903. Method of Solidifying and Excavating the Soil and Constructing Tunnels Charles Sooysmith, New York, N. Y. A pilot tunnel, freezing the surrounding material, annular or spiral annular recesses in the pilot tunnel and freezing material again, enlarging and freezing successively as desired.

720,474. Feb. 10, 1903. Street Sweeper. Daniel Pike, New Orleans, La. Main frame, draft frame, rotary brush and means for operating dirt receptacles in advance thereof, means for raising forward end of main frame, emptying the receptacle and throwing the brush out of gear.

720,536. Feb. 10, 1903. Mold for Concrete Blocks. Edward W. Seamans, Grand Rapids, Mich. Detachable sides and ends, bed-plate with cores attached, stripper plate through which cores project, and stops on plate to locate sides and ends of mold.

720,575. Feb. 17, 1903. Apparatus for Testing and Measuring Strength or Resistance of Materials. Charles Fremont, Paris, France. Drop hammer, work-support intermediate spring supported plate with pointer mechanism and graduated scale.

720,685. Feb. 17, 1903. Grader. John Gottlander, Denver, Colo. Framework, plow formed to cause dirt to pass over rear edge of mold board, means for adjusting.

720,716. Feb. 17, 1903. Hydrant. C. E. Loetzer, Towanda, Pa. Combination with

casing of valve-seat ring and stem-guide beneath, main hydrant valve working above seat, drip post and means for operating automatically.

720,739. Feb. 17, 1903. Artificial Stone. W. G. and A. C. Roach, Cincinnati, O. Certain proportions of clay, sand, lime, salt and fluorspar fused together, cast in heated molds and annealed.

720,747. Feb. 17, 1903. Manufacture of Concrete Beams, Girders, etc., with Iron Bars Inlaid, for Building Purposes. H. Siegwart, Lucerne, Switzerland. First a bed of concrete, then collapsible forms for hollow columns surrounded by concrete, then cutting the columns apart by means of special knives, the collapsible forms being removed when concrete has set.

720,836. Feb. 17, 1903. Tile-Setting. Jas. H. Munro, New York, N. Y. Flexible netting to which to attach small tiles assembled for setting as means for transferring to cement bed for setting.

720,848. Feb. 17, 1903. Process of Producing Artificial Stones. Erich Schwanenberg, Hanover, Germany. Treating artificial stone of specified ingredients with carbonic acid and fresh air to produce stone for lithographic and other purposes.

721,030. Feb. 17, 1903. Brick. Joseph B. Dunlap, Tonkawa, Okla. Ter. Sand as a base, with a chemical binder of soluble silicate of soda, carbolic acid, alum and sulphate of copper in stated proportions.

721,207. Feb. 24, 1903. Rotary Pump. J. B. C. Lockwood, Seattle, Wash. Pump with central induction and tangential discharge openings, a blade-shrouded runner on driving shaft concentric with case, annular shoulder on one cover of case.

721,224. Feb. 24, 1903. Fence Post Mold. W. W. Patton, Woodsfield, O. Divided casing with U-shaped bars attached to one part and adapted for wedges to hold other part in contact.

721,295. Feb. 24, 1903. Water Meter and Boxing. Homer V. Garretson, Worthington, Minn. Meter case with screw-threaded flange, inlet and outlet pipes below, vertical tube to carry dial and hand wheel up as far as desired and removable cylinder surrounding same.

721,364. Feb. 24, 1903. Machine for Cutting Up Ice in Streets, Etc. Carl A. Green, Katrineholm and Hans E. Larsson, Stockholm, Sweden. Frame on runners, movable cutting teeth on cylinder, gatherer immediately behind adapted to collect ice and deposit it in narrow ridge, means for driving the mechanism.

721,534. Feb. 24, 1903. Hollow Block Construction. B. L. Blair, Indianapolis, Ind. Hollow blocks with a fabric pressed into the openings at the ends to hold cement while plastic which is used in laying them.

721,604. Feb. 24, 1903. Garbage or Other Receptacle. Walter Raster, Chicago, Ill. Receptacle with hinged cover having an arm and a bail with an arm so that bail when pressed down by foot will raise cover.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Somerset, Pa.—Main Cross-st. will be paved.

Youngstown, O.—Paving is contemplated for Watt-ave.

Kent, O.—Paving is contemplated for N. Detroit-st.

Weedsport, N. Y.—Paving is contemplated for Clark-st.

Nashville, Tenn.—Paving is proposed for Vanderbilt-ave.

Pomeroy, O.—An ordinance has been to macadamize Main-st.

York, Neb.—Petitions will be circulated asking for street paving.

adopted to pave Front-st.

Hartford, Wis.—This town voted July 20

Fulton, N. J.—Bids will be asked for paving Oneida and Fourth-sts. with macadam.

Marseilles, Ill.—The question of paving Main-st. is being agitated.

Sandusky, O.—Estimates will be prepared for paving Railroad-st.

Portsmouth, O.—An ordinance has been passed for paving Market-st.

Woodbury, N. J.—The council has decided to pave with asphalt.

Waukesha, Wis.—Brick paving has been decided upon for Williams-st.

Glens Falls, N. Y.—Paving is proposed for South and Notre Dame-sts.

Waterville, O.—An ordinance has been passed to pave State-st. with brick.

Springfield, O.—Grading and graveling is proposed for a number of streets.

Des Moines, Ia.—Clark-st. from Sixth to Eleventh will be paved with asphalt.

Ottumwa, Ia.—A resolution was passed July 13 providing for paving E. Maple-st.

Bellevue, O.—The question of paving Fairfield-ave. from Patchen to Berry-

aves. with brick or macadam is being discussed.

Clinton, Mo.—Paving is contemplated for the business streets. Mayor Armstrong.

Galesburg, Ill.—The reconstruction of the Main-st. pavement is contemplated.

Pekin, Ill.—An ordinance was passed July 20 for paving a number of streets.

Ironton, O.—Resolutions have been adopted for improving Court-alley and Fifth-st.

Champaign, Ill.—An ordinance has been passed for 6,073 sq. yds. of brick paving.

Pekin, Ill.—An ordinance was adopted July 20 for paving certain alleys with brick.

Lowell, Mass.—An appropriation of $6,500 has been made for macadamizing Gorham-st.

Fremont, O.—Resolutions of necessity for paving W. State-st. have been passed.

Rhinelander, Wis.—Brick paving is contemplated for Davenport-st., from Brown to Stevens.

Greenwich, Conn.—The boro warden and burgesses voted to pave Grenewich-ave. with brick.

Ann Arbor, Mich.—Asphalt block paving is proposed for Washington-st., from Pearl to Cross.

Meriden, Conn.—Macadam paving is contemplated for S. Meriden-road. George W. Miller, selectman.

Dwight, Ill.—An ordinance has been passed for paving several streets with brick on concrete.

Stillwater, Minn.—Bids will be asked for repaving Chestnut and Myrtle-sts. with brick or sandstone.

Kalamazoo, Mich.—The residents on Vine-st., between Burdick and Park, have petitioned for paving.

Anderson, Ind.—Council has voted to improve Henry and Sherman-sts. with gravel and cement sidewalks.

Council Bluffs, Ia.—Resolutions were passed July 13 for paving a large number of streets with brick.

Tiffin, O.—Hall-st., from Washington to Sandusky, will be paved this summer. C. P. Peters, cy. engr.

Lafayette, Ind.—Bids will be asked for at once for constructing an asphalt floor on the Main-st. bridge.

Riverside, Cal.—Asphalt paving on concrete foundation is contemplated on Main, Seventh and Eighth-sts.

Sterling, Ill.—The property-owners on Seventh-st., from C to G-aves., have petitioned for macadam paving.

Pine Bluff, Ark.—A petition is being circulated asking that the paving on Second-ave. be extended two blocks.

Sterling, Ill.—A petition is being circulated on Fourth-ave., between Third and Seventh-sts., for brick paving.

Freeport, Ill.—A committee will visit Buffalo, N. Y., and Columbus, O., to inspect rock asphalt pavement.

Dallas, Tex.—The residents on Junius-st., between Haskell and Fitzhugh-sts., are in favor of macadam paving.

Lancaster, O.—An ordinance has been passed for paving E. Fifth-st., from High to Maple, with brick. Cy. Engr. Wolfe.

Winterset, Ia.—Council has ordered the construction of cement sidewalks around the public square.

East Dubuque, Ia.—The question of issuing bonds for improving Wisconsin-ave. will be voted on in March.

Galena, Ill.—The construction of two blocks of asphalt or brick paving on Main-st. this year is contemplated.

Anderson, Ind.—Council voted July 20 to improve with gravel and cement walks Henry, Sixteenth and Sherman-sts.

Chicago, Ill.—Ordinances have been passed for asphalt paving on California, N. Francisco and Woodlawn-aves., granite on W. Eighteenth and Illinois-sts. and macadam on W. Sixth-st.

Holyoke, Mass.—The citizens of South Holyoke have petitioned for better paving on Main-st. Mayor Chopin.

Houston, Tex.—No bids were received July 20 for paving Runnels-st. and the work will have to be readvertised.

Newport, R. I.—The question of issuing $50,000 bonds for building granolithic walks will be voted on Aug. 6.

Mt. Clemens, Mich.—The cy. clk. has been authorized to ask for bids for paving Cass-ave., from Walnut to North-ave

Moline, Ill.—The property owners on Market-square have petitioned for paving. Henry G. Paddock, cy. engr.

Saginaw, Mich.—Plans and specifications for macadamizing Tilden-st. from Bristol to Holden, have been approved.

St. Paul, Minn.—A final order has been passed for macadamizing W. Seventh-st. from Tuscarora to Ft. Snelling bridge.

Pawtucket, R. I.—An appropriation of $18,000 has been made for improving Esten, Woodlawn, Patterson and Warren-aves.

Charlotte, N. C.—The question of issuing $200,000 for road improvements will be voted on Aug. 11. J. H. Weddington, chmn. co. comrs.

Columbus, Ga.—The estimated cost of constructing 12,000 feet of cement sidewalks is between $8,000 and $10,000.

Wooster, O.—An ordinance has been passed for paving E. North-st. from Beall-ave. to Spike-st. C. A. Weiser, prest. coun.

Gibson City, Ill.—Plans and specifications will be prepared by Chas. Cottingham of Danville for brick paving on Sangamon-ave.

New Haven, Conn.—The bd. of warden and burgesses of West Haven, voted July 14, to macadamize Campbell-ave. from Elm to Main-sts.

Benton Harbor, Mich.—The city council will give a hearing Aug. 3 on the proposed paving of Water-st. with asphalt. Willard J. Banyon, city clerk.

Cortland, N. Y.—The board of public works rejected the bids received July 20 for paving the east end of Port Huron-st. and new bids will be asked.

St. Joseph, Mo.—Rock asphalt paving is contemplated for Mitchell-ave. from Eleventh to Fifteenth-sts. and vitrified brick from Eighth to Eleventh-sts.

Memphis, Tenn.—The property owners on Moon-ave. have petitioned for mac-

adam or gravel paving with concrete curb and gutters. Cy. engr. Onburg.

Voted to make appropriations for highway improvements; Windsor Locks, Conn., $9,000; Wallingford, Conn., $9,000; Haddam, Conn., $9,000.

Springwells, Mich.—The question of issuing $50,000 bonds for paving Michigan-ave. from Livernois-ave. to Central-ave. has been favorably voted on.

Elwood, Ind.—The commissioners of Madison and Tipton counties decided July 25 to order the construction of one and a half miles of the De Harity-Legg gravel road.

Belleville, Ill.—Ordinances were passed July 20 for paving N. Illinois and W. Main-sts. with vitrified brick, and Race-st. with asphalt. Cy. engr. Graner.

Elgin, Ill.—Petitions are being circulated for macadam paving on Porter and Division-sts. Concrete curb and gutters will be constructed on Liberty-st. and Hill-ave.

Little Rock, Ark.—A petition has been submitted to the council asking for eleven blocks of asphalt paving over the present macadam foundation. John O'Brien, st. comr.

Syracuse, N. Y.—The highway committee reported favorably July 20 on a petition for paving Dudley-st., from W. Onondaga to Delaware, with asphalt or vitrified brick.

adopted for paving Cleveland-ave. from Passaic to Fifth-st. with brick on concrete. Peter Sullivan, prest. coun. B. P. Walsh, town clerk.

St. Joseph, Mo.—Ordinances have been passed for macadamizing Poutin, Jones, Main, Nineteenth, Franklin and Fifteenth-sts. and paving with brick Commercial-st. and a number of alleys.

Buffalo, N. Y.—(Special.)—Resolutions have been approved for repaving Baynes, Maynard and Ellicott-sts. and Elmwood and Cleveland-aves. with Trinidad lake asphalt. Charles F. Surdorf, cy. clk.

Cincinnati, O.—Ordinances were passed July 13 for paving Fourth-st. from John to Pike, Sixth-st. from Sycamore to Broadway, Seventh from Main to Broadway, and May from Oak to Fern, with asphalt.

Gas City, Ind.—A new gravel road eight and a half miles long is contemplated. Cortez Knight, engr.; Frank Mackey of Michaelsville, Alfred Miller of Marion and Thomas Doyle of Van Buren, viewers.

Portland, Ore.—A resolution has been passed for paving Marshall-st. from Twenty-second to Twenty-fifth-sts. with Warren's bitulithic pavement. Also for building artificial stone sidewalks in Hawthorne-ave. Thomas C. Devlin, cy. audt.

Omaha, Neb.—Andrew Rosewater, cy. engr., has prepared new paving specifications which include asphalt and macadam.

South Omaha, Neb.—A petition has been submitted asking council to pave Twenty-fourth-st. from Q-st. to the Sarpy county line with Colorado sandstone.

Grosse Pointe, Mich.—The Grosse Pointe twp. board and the village council of this place visited Kalamazoo, Mich., July 20 to inspect the pavement recently laid by the Central Bitulithic Paving Company, preliminary to paving Jefferson-ave.

Milwaukee, Wis.—Resolutions have been adopted for paving Wells-st. from Twenty-third to Twenty-fourth with asphalt, and from Twenty-fourth to Twenty-sixth with brick; Third-st. from Hadley to Burleigh with brick; North-ave. from Western-ave. to Thirty-sixth-st. with macadam.

Frankfort, Ind.—A petition for grading and graveling and building vitrified brick sidewalks on Third-st. from Armstrong to Park has been referred to the committee on streets and alleys. Cement walks will be built on S. Jackson and W. Walnut-sts. Mayor Clark.

Cincinnati, O.—The county engineer has been directed to prepare estimates of the cost of granite block paving on Spring Grove-ave. from Carthage pike to Mitchell-ave. The estimated cost of improving Mitchell-ave. from Clinton Spring-ave. W. is $130,000.

Omaha, Neb.—Council approved the action of the board of public works June 20 for including specifications for bitulithic paving in the new paving specifications of this city. Judge Dickinson granted a temporary injunction July 21 in the case of Cowduroy vs. the city and board of public works, asking that the city be prevented from letting a contract to the Nebraska Bitulithic Company to pave and repair streets. Judge Dickinson held that the Barber company had no chance to comply with the plans and specifications called for by the board. The Barber company will appeal the case to the supreme court.

CONTRACTS TO BE LET.

Auburn, N. Y.—Bids are asked unti Aug. 3 for paving E. Genessee-st.

Rockville, Ind.—Sealed bids are asked until 12 m. Aug. 6 for building four gravel roads. Bd. co. comrs.

Delphi, Ind. — Bids are asked until 1 p. m. Aug. 6 for constructing a gravel road. Bd. co. comrs.

Versailles, Ind.—Sealed bids are asked until 12 m. Aug. 4 for macadamizing roads. Bd. co. comrs.

Dillon, Mont.—Bids are asked until Aug 5 for constructing cement sidewalks and crossings for a year.

Newcomerstown, O. — Sealed bids are asked until 12 m. Aug. 10 for street paving. C. B. Moort, vil. clk.

Madison, Wis. — Bids are asked until Aug. 7 for paving Mound-st. with macadam. O. S. Norseman, cy. clk

St. Paul, Minn.—Bids are asked until 2 p. m. Aug. 3 for grading Hamline-ave., from Portland to Ashland-aves

Laporte, Ind. — Bids will be received Aug. 3 for macadamizing seven miles of roads in New Durham township. Co. comrs.

Taylorville, Ill. — Bids are asked until Sept. 10 for 55,059 sq. yds. of brick paving. A. B. Alexander, cy. engr.

Cleveland, O.—Bids are asked until Aug. 8 for paving Berea and River roads. Julius C. Dorn, clk. bd. co. comrs.

Grenecastle, Ind.—Bids are asked until Aug. 4 for improving 2 mis. stone road in Warren twp. P. F. Stone, co. aud.

Seymour, Ind. — Bids are asked until Aug. 6 for grading and macadamizing Second-st. Louis E. Jennings, cy. clk.

New Albany, Ind.—Sealed bids are asked until 2 p. m. Aug. 3 for paving certain alleys with brick. E. L. Brisby, cy. clk.

Charleston, S. C.—Sealed bids are asked until 12 m., Aug. 3, for 17,000 cu. yds. crushed stone. G. P. Howell, capt. engrs.

Salem, Ind.—Bids are asked until Aug. 3 for building ten miles of gravel road in Brown township. Frank E. Morris, co. audt.

Anderson, Ind. — Bids are asked until Aug. 17 for building 5-ft. cement walks on Sixteenth-st., from Madison-ave. to Locust-st

Decatur, Ind.—Sealed bids are asked until 6 p. m., Aug. 4, for vitrified brick paving on Fourth and Monroe-sts. D. M. Hower, city clk.

Albany, N. Y.—Bids are asked until Aug. 7 for improving about 3 mis. of Burr's Mills road. Edw. A. Bond, state engr. and surveyor

Paoli, Ind.—Bids are asked until Aug. 5 for 18,700 ft. of road in Northwest twp. and 9,014 ft. French Lick twp. Geo. W. Tegarden, co. audt.

Marshalltown, Ia.—Bids are asked until 2 p. m., Aug. 3, for paving W. Main, Byron and Second-ave. with brick, according to press reports.

Buffalo, N. Y.—Sealed bids are asked until Aug. 6 for paving Atlantic-ave., Hartman Place and Walden-ave. Francis G. Ward, comr. pub. wks.

Chicago, Ill.—Sealed bids are asked until Aug. 5 for asphalt, brick and macadam paving in a large number of sts. A. M. Lynch, bd. local impvts.

Peekskill, N. Y.—Sealed bids are asked until Aug. 5 for paving First, Second, Third, Fourth and Fifth-sts. with brick on concrete. Albert E. Cruger, clk. bd. trustees.

Wilmington, Del.—Sealed bids are asked until 10 a. m., Aug. 11, for macadamizing the new road and Elsemere road. C. J. Horrigan, chm. Del. state highway comn.

Kearney, N. J.—Sealed bids are asked until 4 p. m., Aug. 6, for paving and improving the Belleville turnpike road. John P. Egan, clk. bd. chosen freeholders.

Freehold, N. J.—Bids are asked until 12 m., Aug. 12, for constructing 4½ mis. of stone and gravel road on Corliss-ave. John Guire, dir. bd. chosen freeholders.

Ottumwa, Ia.—Sealed bids are asked until Aug. 3 for 3,500 sq. yds. of brick paving and 2,500 lin. ft. of cement curb. C. R. Allen, cy. engr.; H. P. Keeyho, chm st. com.

Stevens Point, Wis.—Bids are asked until Aug. 13 for vitrified block paving on macadam foundation on Main-st. and Strongs-ave. Thos. A. Humphrey, chmn. B. P. W.

Sullivan, Ind.—Sealed bids are asked until 11 a. m., Aug. 7, for 1 mi. of stone roads, and until 11 a. m., Aug. 10, for 31,207 ft. of free gravel roads. J. M. Lang, co. audt.

Moorehead, Minn.—Sealed bids are asked until 2 p. m. Aug. 4 for grading 5 mis. of road between the towns of Moland and Spring Prairie. G. B. Gunderson, clk. town of Moland.

Boston, Mass.—Sealed bids are asked until 11 a. m., Aug. 6, for grading and constructing walks at Ft. Strong, L. I., Boston Harbor, Mass. A. M. Palmer, depot Q. M.

Indianapolis, Ind.—Sealed bids are asked until Aug. 5, 7 and 10 for grading and graveling a number of streets and constructing cement sidewalks. Harold C. Megrew, chmn. B. P. W.

Newport, R. I.—Sealed bids are asked until 11 a. m., Aug. 10, for furnishing and delivering Portland cement, broken stone and sand at Ft. Greble, R. I. Cassine E. Gillette, capt. engrs.

Celina, O.—Sealed bids are asked until 12 m., Aug. 8, for constructing pikes on Rockner road, Bohmann road, Clune road and Heirholzer road. Chas. A. Kloeb, co. audt.

Mankato, Minn.—Sealed bids are asked until 2 p. m., Aug. 4, for paving 6 blocks of Fifth-st., from Hickory-st. to Madison-ave. with asphalt, with curbing, guttering and boulevarding. B. P. W.

Cincinnati, O.—Sealed bids are asked until 12 m., Aug., 11, for constructing and repairing artificial stone sidewalks in the eastern and western sidewalk districts. Geo. F. Holmes, clk. B. P. S.

Dunkirk, N. Y.—Bids are asked until Aug. 12 for paving or macadamizing as follows: Elk-st., 16,400 sq. yds.; Smith-st., 3,700 sq. yds.; Lamphere-st., 5,000 sq. yds. Jas. P. Morrissey, cy. engr.

Scranton, Pa.—Sealed bids are asked until 3 p. m., Aug. 3, for laying 5 ft. flagstone walks on Cedar, Pittston and Stone-aves. and Cherry, Brook, Fig and Genet-sts. B. T. Jayne, dir. dept. pub. wks.

Millville, N. J.—Bids are asked until Aug. 12 for constructing a state and county road leading from Mauricetown bridge to the intersection of Port Elizabeth and Dorchester roads, in Maurice River twp. Geo. Reeves, dir. bd. chosen freeholders.

Celina, O.—Sealed bids are asked until 12 m. Aug. 4 for paving Walnut-st. from Livingstone to Logan. A. W. Fishbaugh, cy. engineer; F. H. Kreusch, vil. clk.

Davenport, Ia.—Sealed bids are asked until 2 p. m. Aug. 4 for paving certain alleys with vitrified brick on concrete base. Thomas Murray, cy. engr.

Ottumwa, Ia.—Sealed bids are asked until 8 p. m. Aug. 3 for grading W. Fourth and Phillips-st. P. H. Keyhoe, chmn. st. com.

CONTRACTS AWARDED.

Chariton, Ia.—The contract for street paving was awarded to G. J. Stewart & Co. at $1.84 a sq. yd.

Ionia, Mich.—The contract for paving Main-st. with brick was awarded to F. B. Holmes of Detroit.

Richmond, Ind.—Alden Brown & Co. was awarded the contract, July 17, for macadamizing N. D-st.

Bryan, O.—The contract for paving was awarded, July 14, to W. J. Karsh & Co. of Greenville, O., for $94,000.

Barre, Vt.—The contract for paving Main-st. was awarded to A. J. Langfelt of Fitchburg, Mass., for $7,969.

Terre Haute, Ind.—The contract for paving S. Fourth-st. with brick was awarded, July 14, to Foulkes & Forbes.

South Bethlehem, Pa.—The contract for paving and curbing in the First ward was awarded July 20 to S. S. Wagner.

Findlay, O.—C. B. Hall & Son submitted the lowest bid July 20 for paving W. Crawford, Elm and E. Hardin-sts.

Ashland, Wis.—The contract for paving Prentice-ave. was awarded to the Barber Asphalt Paving Company for $35,000.

Menominee, Wis.—The contract for paving Main-st. with brick was awarded, July 7, to John O. Jones of Racine for $43,000.

Burlington, Ia.—George Kriechbaum was awarded contracts July 20 for improving Twelfth and Franklin-sts. and an alley.

Lorain, O.—Contracts for paving Third-ave., Bank and Prospect-sts. have been awarded to the Ohio Engineering Company.

Woonsocket, R. I.—The contract for bitulithic paving on Clinton-st. has been awarded to Warren Bros. of Boston, Mass.

Altona, Ill.—A contract for laying 220 feet of cement walk on Main-st. was awarded to Hjerpe & Munson of Galesburg.

San Jose, Cal.—The City Street Improvement Company was awarded the contract for paving Santa Clara-st., between Third and Fourth.

Alexandria, La.—The Barber Asphalt Paving Company was awarded contracts for asphalt paving on Jackson-sts., July 7, at $2.10 a sq. yd

New Castle, Ind.—The city council awarded a contract July 28 to the Barber Asphalt Paving Company, of Ft. Wayne, for paving S. Main st. with asphalt at $2.05 a square yard.

Rochester, N. Y.—The contract for paving Clifford-st. with Metropolitan brick was awarded to Lauer Hageman for $20,668.

Three Rivers, Mich.—The contract for paving St. Joseph-ave. was awarded to J. C. Conley for $16,567, according to press reports.

Delphi, Ind.—The contract for constructing 26 miles of gravel and macadam road was awarded to Jas. M. Pierce of this city for $64,439.

Louisville, Ky.—Contracts for paving Rosewood-ave. and First-st. were awarded July 17 to the American Standard Asphalt Company for $16,000.

Harrisburg, Pa.—The Barber Asphalt Paving Co. submitted the lowest bids, July 13, for paving 9 streets with asphalt, at $1.70½ and $1.80 a sq. yd.

Binghamton, N. Y.—The Barber Asphalt Paving Co. was awarded the contract for repairing 7,000 sq. yds. of asphalt paving, at $1.14 a sq. yd.

Elgin, Ill.—The contract for paving Grove-ave. with rock asphalt was awarded, July 13, to the New Centrury Paving Company of this city for $29,427.68.

London, Ont.—The contract for paving York-st. between Talbot and Richmond-sts. with bitulithic pavement was awarded to Warren Bros., of Boston, Mass.

Dallas, Tex.—J. W. Fields was awarded the contract, July 15, for paving Akard-st. from Commerce-st. to Ross-ave. with vitrified brick, at $2.22 a sq. yd.

St. Paul, Minn.—The Barber Paving Company has awarded the contract for paving Pleasant-ave from Ramsey to Garfield-st., at $2.02 a sq. yd.

Charitor, Ia.—The contract for paving the public square and one street with brick was awarded, July 13, to J. G. Stewart & Co., at $1.84 a sq. yd.

Moline, Ill.—The property owners on Eleventh-ave., between Sixteenth and Seventeenth-sts., have petitioned for a 4-ft. cement sidewalk. Chas. G. Carlson, city clerk.

Bowling Green, Ky.—Contracts for constructing stone roads have been awarded as follows: Geo. Mercer, 4 miles, $10,860; Paterson Bros. & Co., 7 miles, $30,172.

Canonsburg, Pa.—The contract for grading, curbing and paving Pike-st. was awarded to the Hallam Construction Company, of Washington, Pa., for $49,800.

Pt. Huron, Mich.—The contract for paving Third-st. with brick was awarded to G. S. Germain. Griswold-st. and Lapeer-ave. will be repaved by W. J. Clancy of Ann Arbor.

Brooklyn, N. Y.—The Uvalde Asphalt Company submitted the lowest bids July 11 for repaving a number of streets with Asphalt, the bids amounting to $110,000.

Milwaukee, Wis.—The Badger Construction Company was awarded seven contracts for paving streets with brick, July 16, at prices ranging from $2.11 to $2.39 a square yard.

Wilmington, Del.—The contract for constructing Hares Corner-road was awarded July 7 to the Christiana Construction Company for $15,736 for sixteen feet roadway eight inches deep.

Springfield, Ill.—Nelch & Patterson secured contracts for paving N. Grand-ave. and Cook-st. with brick at $1.46½ a square yard and 51 cents a lineal foot for curbing.

Bay City, Mich.—The contract for paving Johnston-st. from Center-ave. to Sixth-st. with vitrified brick on concrete base was awarded to Robert Donohue & Co. for $2,400.

St. Johns, Mich.—The contract for paving Clinton-ave. and Walker-st. was awarded July 17 to Lloyd & McKay of Detroit. Lane brick will be used.

Oshkosh, Wis.—The contract for paving Main and Algoma-sts. with asphalt was

awarded July 16 to the Barber Asphalt Company at $2.41½ a square yard

Grand Rapids, Mich.—The contract for paving W. Fulton-st. was awarded July 17 to James McDermott & Son for $19,349 and for Commerce-alley to J. H. Sullivan for $5,666.66.

Indianapolis, Ind.—The Hoosier Construction company was awarded the contract for paving Ashland-ave. with Kreydone creosoted wood blocks at $5.52, the highest bid, because Kreodone oil was the best offered.

Milwaukee, Wis.—The Badger Construction Company was awarded contracts for brick paving July 15 as follows: Virginia-st., $2.11 and N. Water-st. and Juneau-ave., $2.14 a square yard.

Birmingham, Ala.—The contract for building sidewalks was awarded July 15 to the Birmingham Contract Company for $922 and the contract for grading and curbing to C. M. Burkwalter for $1,657.50.

Columbus, O.—The contract for paving Marion-court between Division and Elm-sts. and Rees-st. between Halstead-st. and Chicago-ave., with rock asphalt, was awarded to A. G. Pugh of Columbus, O.

Princeton, Ind.—The contract for constructing gravel and macadam roads in Patoka and White river townships was awarded July 20 to George C. White & Co. of Boonville, Ind., for $122,024.29 and $52,789 respectively.

Marshalltown, Ia.—The contract for ten blocks of paving was awarded July 6 to the Barber Asphalt Paving Company at $1.97 a square yard; combined curb and gutter 65 cents a lineal foot; excavating 30 cents a cubic yard.

Leavenworth, Kans.—The Parker-Washington Company, Kansas City, Mo., was awarded the contract July 8 for paving Walnut-st. from Second to Third with brick at $1.51 a square yard for paving and 30 cents a cubic yard for grading.

Kalamazoo, Mich.—(Special.)—Bids were received July 6 for paving South and Park-sts. from the Barber Asphalt Paving Company, Cleveland Trinidad Paving Company, Central Bitulithic Paving Company, W. W. Hatch & Sons and Thomas J. Sales

South River, N. J.—John Van Deusen of New Brunswick was awarded the contract July 16 for curbing as follows: 4x20 curb, 53 cts. a lin. ft.; 4x16, 46 cts.; circular, 90 cts.; brick gutters, 65½ cts.; total, $7,085.

Pleasantville, Conn.—The contract for improving Ossining road at Mt. Pleasant was awarded to W. W. Law for $11,693. The Bellew & Merritt Company of Tuckahoe secured the contract for improving Wheeler-ave., this city, for $3,100.

Sharon, Pa.—Brick paving contracts were awarded July 21 as follows: Cochran & Parody, of Mahoningtown, Shenango-st., $6,635; River-st., $3,634; Sharpsville-st., $9,488; State-st., $7,174. Frederick Robinson, of Meadville, Oakland-ave., $19,648. McIntyre & Sons, Vine-st., $7,732.75; Pine-st., $1,258.75; Logan-ave., $5,025.

New Albany, Ind.—The Barber Asphalt Paving Company was awarded contracts July 6 for paving Spring, State, Main, Vincennes and E. Seventh-sts. with asphalt at $1.74 a sq. yd.; curbing, 65 cts. a lin. ft.; excavating, 40 cts. a cu. yd.

Philadelphia, Pa.—The Vulcanite Paving Company secured contracts for paving eighty-five streets at prices ranging from $2.15 to $2.22 a sq. yd., and the Filbert Paving & Construction Company for two streets at an average of $2.03 a sq. yd.

Michigan City, Ind.—The contract for paving Ohio-st., from Boston-st. to section 23 in Michigan twp. was awarded July 17 to J. E. Southard at $1.74 a sq. yd. for metropolitan block; curb, 29 cts. a lin. ft.; grading, 24 cts. a cu. yd.

New Haven, Conn.—C. W. Blakeslee & Sons secured contracts for paving as follows: Lake-place, macadam paving, 67 cts. a sq. yd., and Belgian block gutters, $2.05 a sq. yd. Grant-st., macadam paving, 73 cts., and Belgian block gutters, $2.15 a sq. yd.

Champaign, Ill. — Bids were submitted July 21 for paving W. Washington-st., from Neil to Lynne., as follows: John W. Stipes, Danville brick, $13,074.94; Clinton brick, $12,957.60. Thompson & Case, Danville brick, $12,337.50; Clinton brick, $14,268.14.

Decatur, Ill.—The contract for asphalt paving on Center and N. Water-sts. has been awarded to the Barber Asphalt Paving company at $1.80 a sq. yd.; combination curb and gutter, 60 cents a lin. ft.; tile, 5 cents a ft.; four catch basins, $30 each; total, $7,437.80.

West Bay City, Mich.—The lowest bid submitted July 20 for paving Henry and Washington-sts. with brick was that of Patrick Ryan, at $1.78 a sq. yd., and for asphalt, Cleveland Trinidad Paving Company, at $2 a sq. yd.

New Orleans, La.—The Barber Asphalt Paving Company was awarded contracts July 8 for asphalt paving as follows: Repairing asphalt pavement on Rampart-st., $4,475.70; paving Lafayette-st., $2,827.40; Howard-ave., $1,934.69; St. Charles-st., $52,915.48.

Rochester, N. Y. — Bids were received July 17 for paving University-ave. from Alexander to Culver-sts., and, apparently, Whitmore, Rauber & Vicinus are the lowest bidders on the four materials upon which bids were submitted—brick, asphalt, Medina block stone and macadam.

Newport, R. I.—Contracts were awarded July 6 for constructing four sections of macadam highway, as follows: Half-mile section in Little Compton, Joseph McCormick of East Providence, $3,350.40; half-mile in Warren, Lane Construction Company of Meriden, Conn., $5,234.50; one mile in East Greenwich, A. D. Bridge, $4,695.95; 1,789 ft. in Bristol, A. D. Bridge, $3,708.50.

Syracuse, N. Y.—Bids were received July 20 for making asphalt repairs during the remainder of 1903 as follows: Barber Asphalt Company, 99 cts. a sq. yd.; Central City Paving Company, $1.55; Syracuse Improvement Company, $1.45. The contract for paving Canal-st., from McBride-st. to N. Crouse-ave., with brick, will probably be awarded to the Central City Paving Company for $17,819.70.

Syracuse, N. Y.—The contract for paving W. Board-ave., from Landon to Midland, was awarded to the Syracuse Improvement Company for $7,730.50. The contract for paving Syracuse-st., from Ulster to W. Fayette, and W. Fayette, from Syracuse and Nelson-sts. to Magnolia, with brick was awarded to F. J. Baker for $1,701.60.

Washington, D. C.—The contract for laying asphalt block pavements in the District of Columbia during the current fiscal year was awarded July 8 to the Washington Block and Tile Company as follows: 5-inch asphalt block on gravel base, $1.77 a sq. yd.; 3-inch asphalt block on 5-inch concrete base, $1.80 a sq. yd.

Utica, N. Y.—Bids for asphalt paving were received, July 17, as follows: Broad-st., from Mohawk-st. to Basin bridge—Syracuse Improvement Company, $5,251.50; Barber Asphalt Paving Company, $5,105.50. Clark-place, from Park-ave. to King-st.—Syracuse Improvement Company, $2,751.30; Barber Asphalt Paving Company, $2,722.30. Hoyt-st., from Whitesboro to Water-st.—Syracuse Improvement Company, $2,696.90; Barber Asphalt Paving Company, $2,650.70.

Chicago, Ill.—Paving contracts were awarded July 24 as follows: R. F. Conway Company — Burling-st. from Belden to North-aves., asphalt; W. Chicago-ave. from N. Ashland-ave. to Northwestern-ave., asphalt; Washington-place from N. Clark-st. to Dearborn-ave., asphalt. Barber Asphalt Paving Company —S. Campbell-ave. from W. Madison to W. Lake-sts.; Front-st. from Elston-ave. to N. Sangamon-st.; W. Quincy-st. from S. Halstead to S. Desplaines-sts.; Tellplace from N. Ashland to Milwaukee-ave. Citizens' Construction Company — S. Spaulding-ave. from W. Harrison to Lexington-sts., asphalt.

Buffalo, N. Y.—The contract for resurfacing and repairing asphalt streets for the coming fiscal year was awarded to Henry P. Burgard at 97 cents a square yard for resurfacing by which entire asphalt surface is to be taken out to the concrete and to include all work necessary except new concrete; $2.55 a square yard for replacing concrete and asphalt surface, including removing and replacing spongy earth where necessary; 5 cents a lineal foot for scraping joints between curb and pavement and coating gutters 12 inches wide with pure hot asphalt and smoothing with hot smoothing irons; 2 cents a lineal foot for cleaning out cracks, pouring them with hot asphalt and smoothing with hot smoothing irons; 15 cents a lineal foot for replacing stone along railroad tracks between track and asphalt pavement, with concrete base and pouring joints of same with grout and making asphalt connection between stone and asphalt pavement. The contract for furnishing hard Medina sandstone paving blocks, crosswalks and curbing for stone pavement repairs for the year was awarded, July 20, to Chas. A. Gorman, at $15.50 per cord for paving blocks, 49 cents a lineal foot for 18-inch and 64 cents for 24-inch crosswalks; 35 cents for 18-inch curbing; for furnishing sand and gravel for stone pavement, Point Abino Sand Company, 75 cents a cubic yard for both sand and gravel. The contract for constructing and repairing hard material sidewalks was awarded to Eli D. Hofeller at 11 cents a square foot. Bids were received July 13 for paving and repaving N. Pearl, Spruce, Fifteenth, Tupper, Ellicott, Clinton, Bond, Krettner, Eagle, Seneca and Rosssts. and Westo-alley. Bids were also received July 20 for macadamizing, paving and repaving a number of streets.

SEWERS.

Portage, Wis.—In a decision rendered by Judge Stevens July 15 the village authorities are restrained from the construction of a sewer.

CONTEMPLATED WORK.

Owosso, Mich.—A sewer in King-st. is contemplated.

Webster City, Ia.—A storm sewer is needed in Division-st.

Indiana, Pa.—Plans have been adopted for a sewerage system.

West Point, Miss.—The estimated cost of the proposed sewerage system is $25,000.

Penn Yan, N. Y.—This city has voted $75,000 for constructing a sewerage system.

Marlboro, Mass.—Plans are about completed for the proposed auxiliary sewerage system.

Demopolis, Ala.—An ordinance has been passed authorizing the issue of bonds for building a sewerage system.

Hutchinson, Minn.—The question of extending the sewerage system is being agitated.

Matteawan, N. Y.—Contracts will probably be let about Sept. 1 for a sewerage system.

Moscow, Idaho.—The estimated cost of a sewerage system with septic tank is $100,000.

Dixon, Ill.—Ordinances have been adopted for building sewers on E. and W. Chamberlain-sts.

Wichita, Kas.—The construction of storm water sewers is proposed. J. T. Leland, cy. clk.

Austin, Tex.—Final plans and specifications for the proposed storm sewer have been completed.

West Hoboken, N. J.—Plans for a joint outlet sewer to connect with Weehawken have been adopted.

Malden, Mass.—An ordinance has been passed providing for an issue of $10,000 for building new sewers.

Galesburg, Ill.—An ordinance has been passed for building a sewer on Maple-ave., at a cost of $2,668.97.

Anderson, Ind.—Resolutions have been favorably acted upon for building sewers on Madison and Nichol-aves.

Geneva, N. Y.—The board of public works is considering the establishment of

a reduction plant for the disposal of sewage.

Skaneateles, N. Y.—At a public meeting held July 21 the prevailing opinion favored the construction of sewers.

Portland, Ore.—Ordinances have been adopted for building sewers in certain streets. Thomas C. Devlin, city auditor.

Oswego, N. Y.—The city engineer and superintendent have been directed to prepare plans for sewers in Ontario and W. Third-sts.

Massillon, O.—The construction of sewers in E. Tremont, W. Main and S. Mill-sts., and a storm sewer in North-st. are contemplated.

Scranton, Pa.—Ordinances have passed first and second reading for building additional surface water sewers in a large number of streets.

The question of issuing bonds for building sewerage systems has been favorably voted on at Miller, S. D.

The construction of sewerage systems is contemplated at the following places: Ford, Mich.; Leominster, Mass.; Rushville, Ill.; Brainerd, Minn.

Jackson, Mich.—Plans for a sewage purification plant have been completed by George S. Pierson, of Kalamazoo.

Newport, R. I.—The question of issuing $25,000 bonds for a sewerage system and pumping station in the vicinity of lower Kay-st. will be voted on August 6.

The question of issuing bonds for constructing sewerage systems will be voted on as follows: Athens, Ala.; Wyandotte, Mich., September 20; Moultrie, Ga.

Centralia, Ill.—A sewerage system will be constructed under the supervision of the Iowa Engineering Company, of Iowa City, Ia., at an estimated cost of $50,000.

Alliance, O.—The commissioners of Stark and Columbiana counties are discussing the question of a sewage disposal plant for the Fairmount Children's Home.

Chillicothe, O.—Resolutions have been passed for building storm sewers in Maple, Clay and Seventh-sts. and Eastern-ave., and sanitary sewers on Vine and Water-sts. Mayor Yaple.

Hartford, Conn.—The contracts for building sewers were awarded to the Hartford Paving and Construction Company as follows: Ellicott-st. and private lands, $38,397.80; Franklin-ave., storm water overflow, $28,846.72; Maple-ave., $7,539.10.

Milwaukee, Wis.—Sewer contracts were awarded July 15 as follows: R. J. Hickey, 772 feet of brick sewer at $5.50 and 115 feet of pipe sewer at $2 a lineal foot in Farwell-ave., Windsor-place and Prospect-ave.; John J. Crilley, 1,239 feet of brick sewer at $6.73 and 447 feet of pipe sewer at $1.60 in Kenilsworth-place and Prospect-ave.; George J. Mackey, 234 feet of pipe sewer in Greenwich-st., $1.70 a foot.

CONTRACTS TO BE LET.

Des Moines, Ia.—Bids are asked until Aug. 7 and 14 for building sewers. B. P. W.

Winona, Minn.—Bids are asked until Aug. 17 for a sewer in Winona-st. L. L. Brown, mayor.

Brazil, Ind.—Bids are asked until Aug. 18 for 6,491 feet of sewer. F. K. De Armery, cy. clk.

Trenton, N. J.—Bids are asked until Aug. 4 for building sewer No. 224. C. E. Murray, cy. clk.

Northfield, Vt.—Bids are asked until Aug. 5 for building 5,392 feet of sewers. Vil. bd. trustees.

Ft. Bliss, Tex.—Bids are asked until Aug. 20 for constructing a sewerage system and a septic tank.

Dunkirk, N. Y.—Bids are asked until Aug. 12 for laying 15,000 feet of drain tile. J. P. Groesch, cy. engr.

Centerville, S. D.—Bids are asked until 8 p .m. Aug. 3 for 1,200 feet of brick sewer. A. E. Dann, cy. audt.

Centralia, Ill.—Bids will be received about Sept. 1 for 10 mis. of sewers. Iowa Engineer Company, engrs.

Newcomerstown, O.—Sealed bids are asked until 12 m. Aug. 10 for 3,000 feet of sewers. C. B. Moore, vil. clk.

Elkhart, Ind.—Sealed bids are asked until 4 p. m. Aug. 5 for a sewer in Sycamore-st. Emil V. Anderson, cy. clk.

Wausau, Wis.—Bids are asked until Aug. 4 for building 6,065 feet of sewers in four streets. C. A. Nutter, chmn. B. P. W.

Lafayette, Ind.—Bids are asked until Aug. 10 for building 8-inch sewers in certain streets. Charles F. Williams, jr., cy clk.

Jackson, Mich.—Sealed bids are asked until Aug. 4 for constructing the Clark and Potter drain. F. B. Phillips, co. drain comr.

Monroe, Mich.—Sealed bids are asked until 8 p. m. Aug. 3 for building a sewer in special sewer dist. No. 13. John Stemer, cy. clk.

Brownstown, Ind.—Bids are asked until Aug. 3 for building four stone sewers in various parts of Jackson county. Asbury N. Manuel, co. audt.

Carthage, Mo.—Sealed bids are asked until 5 p. m. Aug. 10, for constructing sewers, with manholes, flush tanks, etc. T. V. Grieb, cy. engr.

Perth Amboy, N. J.—Sealed bids are asked until 8:30 p. m., Aug. 3, for building 550 ft. of 15-in. pipe sewer in Laurie-st. Math Wireup, st. comr.

Creston, Ia.—Sealed bids are asked until 9 a. m., Aug. 3, for building a sewer in Poplar-st. and an alley. J. C. Sullivan, mayor; W. H. Robb, cy. clk.

Washington, D. C.—Bids are asked until 2 p. m., Aug. 27, for building a sewer system at Tulalip School, Wash. W. A. Jones, comr. Indian affairs.

St. Paul, Minn.—Sealed bids are asked until 11 a. m., Aug. 4, for building a sewerage system at Ft. Assinibine, Mont. Geo. E. Pond, C. Q. M.

Cottonwood, Neb.—Bids are asked until 2 p. m., Aug. 3, for building a concrete stone or brick storm sewer in Cottonwood-st. G. W. Graham, cy. engr.

Union, S. C.—Sealed bids are asked until 4 p. m., Aug. 4, for building 10 mis. of pipe sewers. Geo. H. Oetzel, secy. sewerage comn; J. L. Ludlow, engr. Winston, N. C.

Corning N. Y.—Sealed bids are asked until 3 p. m., Aug., 5, for building concrete, brick and pipe sewers, with appurtenances. Frank D. Kingsbury, prest bd. sewer comrs.

St. Bernard, O.—Sealed bids are asked until 12 m., Aug. 21, for a sewer in Carthage pike and Mitchell-ave. Joseph Schwegman, mayor; J. A. Stewart, vil. engr., 813 Traction Bldg., Cincinnati.

Boston, Mass.—Bids are asked until Aug. 4 for building sections 61 and 62 of the Revere extension of the North Metropolitan sewerage system. Met. sewerage bd., 1 Ashburton-place, Boston.

Baltimore, Md.—Proposals with plans will be received until Aug. 15 for installing a sewerage plant to provide for 600 people. Henry F. New, treas. West Arlington Impvt. Co., 211 Union Trust Bldg.

Yazoo City, Miss.—Sealed bids are asked until 8 p. m., Aug. 3, for a sewerage system consisting of 11 mis. of 18 to 6-in pipe sewers, with accessories, centrifugal pumps and engines. E. J. Poursine, cy. clk.

Washington, D. C.—Sealed bids are asked until Aug. 8 for constructing a pipe sewer, and until Aug. 29 for constructing sections B and C of the B-st. and N. J-ave. trunk sewer. H. B. F. MacFarland, chmn. dist. comrs.

Montpelier, O.—Sealed bids are asked until 12 m., Aug. 12, for 3,000 ft. of 54 and 48-in. brick or concrete sewers, and 12,000 ft. of 20, 18, 15, 12, 10 and 6-in vitrified pipe sewers, 20 brick manholes, 10 pipe lampholes, 200 specials for lot connections, 50 pipe catchbasins. Jas. A. Weaver, vil. clk.

CONTRACTS AWARDED.

Nashville, Tenn. — The contract for a sewer in an alley was awarded to J. A. Webb.

Akron, O.—The contract for building the Glenwood-ave. sewer was awarded to John O'Neil for $1,553.44.

Johnstown, N. Y.—The contract for a trunk sewer was awarded to A. M. Banker of Gloversville for $11,958.

Ann Arbor, Mich. — The contract for building a sewer in Sixth-ave. was awarded to E. L. Schneider for $1,353.

Bond Hill, Ill.—The Douglas Pumping and Heating Company of Cincinnati was awarded the contract for building sewers for $36,280.

Burlington, Ia. — The Burlington Construction Company was awarded contracts July 20 for sewers in Bogus Hollow and Stony Lonesome run.

Dowagiac, Mich. — S. W. Emmons secured the contract for building 1,500 ft. of sewers in Oak and Telegraph-sts. at 55 cents a lin. ft.

Birmingham, Ala.—The contract for the Birmingham-Southward division of the county sewer was awarded July 7 to J. D. Truss for $24,766.50.

Utica, N. Y. — J. W. Johnston was awarded sewer contracts July 17 as follows: Hope-st., $185.75; Wetmore-st., $462.25; Catherine-st., $418.75.

Waukegan, Ill.—(Special.)—The contract for constructing sewers in sewer district No. 2 was awarded July 18 to Charles T. Bartlett of Evanston for $24,205.85.

WATER-WORKS.

Knoxville, Tenn.—H. O. Erwing, clerk of the federal court, is taking testimony in the water rate case of the city.

Gadsden, Ala.—A bill of complaints has been filed in chancery against this city for the purpose of testing the validity of an ordinance repealing a contract made with Messrs. Mitchell & Weller to build a water works system.

Akron, O.—This city has filed suit against the Akron Water Works Company to compel it to live up to its contract. Lack of water and pressure is charged, and a movement has been started on the part of the city to purchase the plant.

Ottumwa, Ia.—A second supplemental decree was issued by Judge Smith McPherson at Keokuk, July 20, in the Ottumwa Water Works case. He named Judge A. L. Parsons as special master to sell the property, taking the place of C. J. Smith, who resigned. The property shall all be sold without any right of redemption. The court finds that the franchise expired Sept. 18, 1902, and that there is now no franchise and the city has no legal rights to request the purchaser of the plant to keep it or operate it; the mains are personal property, which the city has a right to remove after the sale; the purchaser has the right to resell the plant or close it down as he desires.

CONTEMPLATED WORK.

Lockport, N. Y.—A new water supply is proposed.

Battle Creek, Mich.—Test wells will be sunk for a water supply.

Hawkinsville, Ga.—Estimates of the cost of water works have been made.

Center Ossippe, N. H.—Surveys are being made for a gravity water system.

Bluffton, Ind.—A meter franchise has been granted the Ft. Wayne Gas Company.

Homestead, Pa.—The question of adopting a meter system has been discussed.

Washington, Ia.—Plans have been prepared for water works. A. I. Miller, mayor.

Greenville, Ill.—An ordinance to establish water meter system has been passed.

Jackson, Minn. — The question of improving the water supply system will be voted on.

Carthage, N. Y.—Plans are being considered for increasing the water supply and pressure.

Shippensburg, Pa.—Plans for a new reservoir and laying larger mains are being prepared.

Youngstown, O.—The plan for a filtration plant to improve the city water sup-

ply was defeated in the city council July 20.

Ely, Minn. — The question of issuing bonds for extending the water system will be voted on Aug. 4.

Manasquan, N. J.—The estimated cost of the proposed municipal water works system is $33,000.

San Francisco, Cal.—Plans for a salt water system for fire protection will be prepared by J. C. H. Stut.

Rumford Falls, Me.—Plans for a water purification plant are being considered by the local water company.

Columbus, O.—The estimated cost of the water works system contemplated for Greenlawn cemetery is $10,000.

Gloucester City, N. J.—The improvement of the water works and the construction of an infiltration plant is proposed.

East Orange, N. J.—This city has decided to purchase 130 acres of land in Millburn and establish a municipal water plant.

Rochester, N. Y.—The Rochester and Lake Ontario Water company has purchased fifteen acres of land in the Cobb's hill tract for reservoir purposes.

Bozeman, Idaho.—The water committee has been instructed to employ a competent engineer to make estimates for increasing the water supply.

Schenectady, N. Y.—The installation of an electric power plant for the water works plant to take the place of the present steam plant is proposed by this city.

Fargo, N. D.—The report of Loweth & Wolff, engineers of St. Paul, has been submitted. They recommend the construction of a mechanical gravity system of $55,335.

Dallas, Tex.—The water comrs. have recommended the purchase of ninety-five tons of 10-inch, thirty tons of 8-inch and 200 tons of 6-inch pipe and a quantity of fire hydrants.

Buffalo, N. Y.—This city has engaged George W. Fuller of New York City to investigate and report on the best means for obtaining a permanent supply of pure water.

New York City.—Robt. Grier Monroe has asked the board of estimates to issue $1,990,000 corporate stock for proposed improvements in the water supply, including the extension of mains and improving the methods of distribution in Brooklyn, Manhattan, the Bronx and Queens; to establish new pumping stations; to have maps made of the water ways; to build 3 infiltration plans; to acquire by condemnation proceedings the property and rights of the Citizens' Water Supply Company of Long Island.

Newark, N. J.—Morris R. Sherrerd estimates the increase in the cost of the Cedar Grove reservoir over the original estimate at $65,000, making the total cost $1,565,000.

The question of issuing bonds for constructing water works will be voted on at the following places: West Point, Va., Aug. 11; Osceola, Ia.; Sumas, Wash.; Houston, Tex., Aug. 4.

The question of issuing water works bonds has been favorably voted on at the following places: Ladysmith, Wis; Forestport, N. Y.; Chandler, O. T.; Cudahy, Wis.; Lethbridge, Ala.

Woodstock, Ill.—An ordinance has been passed for constructing a connected system of c. i. water main pipe, with fire hydrants and gate valves for fire protection on Dane and Dacy-sts.

The extension of water mains is proposed as follows: Grand Forks, N. D.; Rockford, Ill.; Litchfield, Ill.; Laporte, Ind.; Lansing, Mich.; Attleboro, Mass.; Chelmsford, Mass.; Warwick, N. Y.; St. John, N. B.

Chicago, Ill.—Ex-City Engineer Ericson estimates the cost of installing 8,000 meters each year at $200,000. He believes, however, that the city could not only stop all water famines, but could save the $600,000 expended annually in pumping machinery.

The construction of water works systems is contemplated at the following places: Hetland, S. D.; Guckeen, Minn.; Piper City, Ill.; Emmett, Idaho; Vidalia, La.; Ikron, Ia.; Lake Nebagamon, Wis.; Grafton, Wis.; Mammel, O.; Shelton, Neb.; Oxford, Mass.; Garfield, N. J.; Alliance, Pa.; Baton Rouge, La.; Chenoa, Ill.; Bourbonnais, Ill.; Yutan, Neb.; De Soto, Mo.; Delta, Colo.; Cobville, Wash.; Whitby, Ont.; Walsenburg, Colo.; Simsbury, Conn.

CONTRACTS TO BE LET.

Cameron, Mo.—Bids are asked until Aug. 15 for a water works system.

Wahpeton, N. D.—Bids are asked until Aug. 3 for a 10-inch well. F. B. Schneller, cy. audt.

Cody, Wyo.—Bids are asked until Aug. 20 for a water works system. Mayor L. L. Newton, town clk.

Yazoo City, Miss.—Sealed bids are asked until 8 p. m. Aug. 3 for a water works system. E. J. Poursine, cy. clk.

Harris, Ia.—Sealed bids are asked until 8 p. m. Aug. 3 for a water works system. E. E. McFarind, town clk.

Watertown, N. Y.—Sealed bids are asked until 4 p. m. Aug. 17 for constructing a filtration plant. John C. Knowlton, prest. bd. water comrs.

Washington, D. C.—Sealed bids are asked until 2 p. m. Aug. 27 for a water system at Tulalip, Wash. W. A. Jones, comr. Indian affairs.

Salem, S. D.—Sealed bids are asked until 8 p. m., Aug. 10, for laying 6,000 feet of water mains and setting 15 hydrants. W. E. Lane, city audt.

South St. Paul, Minn.—Sealed bids are asked until 7 p. m. Aug. 3 for laying 520 feet of water mains on Second-st. Chas. W. Clark, cy. recorder.

Cosmopolis, Wash.—Bids are asked until 5 p. m., Aug. 5, for digging, curbing and covering a well. W. S. McLaughlin, town clk.

Garrettstown, S. D.—Bids are asked until 8 p. m., Aug. 5, for a 10-in. well; also for a well 10 ft. inside diameter. H. W. Ward, city audt.

Odessa, Wash.—Sealed bids are asked

until 8 p. m., Aug. 6, for building a water works system. Geo. A. Kennedy, mayor; F. J. Hoagland, town clk.

New York City—Bids are asked until Aug. 10 for furnishing 900 tons of c. i. pipe and 12,000 ft. of galvanized iron pipe. D. D. Wheeler, A. Q. G. M.

Tiffin, O.—Bids are asked until Aug. 17 for right to construct and maintain water works in this city for a term of 20 years. Mark L. Leister, mayor.

St. Louis, Mo.—Sealed bids are asked until 12 m., Aug. 14, for improving the water supply system at Jefferson Barracks, Capt. W. C. R. Colquhoun, dept. Q. M.

Rhinelander, Wis.—Sealed bids are asked until 12 m., Aug. 3, for laying a water main from Thayer-st. across the Wisconsin river. Gust Smedburg, city clk.

Washington, D. C.—Sealed bids are asked until 2 p. m., Aug. 4, for constructing a water system at the Umatilla school, Ore. W. A. Jones, comr. Indian affairs.

Edgerton, Minn.—Bids are asked until 8 p. m., Aug. 6, for 420 ft. of 6-in. and 400 ft. of 4-in. water mains and 2 hydrants. John Grundler, vil. recorder.

Easton, Pa.—Sealed bids are asked until 12 m., Aug. 5, for furnishing and erecting a steel standpipe on concrete foundation; also 2 pumps, 2 electric or gasoline engines, pipe, valves and fittings. Jos. Rodenbough, prest. Lehigh Water Co.

Milford, O.—Bids are asked until Aug. 4 for furnishing at the works a station building, tubular steam boiler, compound duplex steam pumps, c. i. water pipes, gate valves, hydrants, etc. N. A. Scott, secy. bd. trustees of pub. affairs.

Washington, D. C.—Sealed bids are asked until 12 m., Aug. 8, for constructing a water tower and lodge at Ft. Reno, D. C.; until Aug. 15, for furnishing 1 steel water tank of 85,000 gals.; until Aug. 20, for furnishing 300 high pressure fire hydrants. H. B. F. MacFarland, chmn. dist. comrs.

Weiser, Idaho.—Bids are asked until Aug. 25 for the enlargement of the main canal of the Weiser Irrigation district and the building of all the necessary structures connected therewith, including a low dam on the Weiser river canal headgates, waste gates, flumes, bridges, and lateral gates. A. J. Green, prest. bd. directors.

CONTRACTS AWARDED.

Rahway, N. J.—Bids were submitted July 20 for a complete gravity filtration plant.

Stuart, Neb.—The contract for a water works system was awarded to B. O. Krotter of Knoxville, Ill., for $10,000.

Coopersburg, Pa.—The contract for a water works system was awarded to Crilley & Rathbun of Allentown, Pa., for $20,000.

Brooklyn, N. Y.—The contract for a forty-eight inch c. i. force main from Ridgewood pumping station to Mt. Prospect high service tower was awarded to John Cashman, 44 Court-st., for $438,000.

Ford, Mich.—The contract for laying water mains, pipes, etc., has been awarded to L. C. Brooks & Son, of Jackson for $17,724.

Davenport, Mich.—The contract for extending the city water mains has been awarded to V. Schroeder of this city for $6,820.

Berlin, Pa.—The contract for constructing water works has been awarded to Chandley Bros. & Co., of Beaver Falls, Pa., for $49,000.

Krester, Minn.—The contract for constructing a water works system was awarded to the Des Moines Iron Bridge Company for $6,000.

Bristol, Va.—The contract for constructing a new reservoir was awarded July 18 to Caldwell & Jackson for $12,000. Adams Bros. & Payne, of Lynchburg, Va., have begun work on the new water works system at Bristol, Tenn.

Sioux Falls, S. D.—Contracts for work on the municipal water works system were awarded July 15 as follows: Furnishing pipes, valves, boxes and hydrants, Dimmock Pipe Company, of Birmingham, Ala., $93,706.44; digging trenches, laying pipes, setting fire hydrants and filling trenches, Lytle & Koenig of this city, $46,960.05. N. Y. Continental Jewell Filtration Company, New York, N. Y., $29,356; the Pittsburg Filter Manufacturing Company, Pittsburg, Pa., $26,650; William M. Deutsch, 141 Broadway, New York, N. Y., $27,868—additional with air wash, $1,965; William B. Scaife & Sons Company, 221 First-ave., Pittsburg, Pa., $24,759; American Water Purifying Company, Indianapolis, Ind., $26,800; Filter Construction Company, Philadelphia, Pa., with preliminary screening, or filter beds, and including general filtration bed, $37,464—omitting same, $25,342.

BRIDGES.

Cleveland, O.—A high level bridge across the river is contemplated.

Boonville, Ind.—Bids are asked until Aug. 12 for a wooden bridge. Co. comrs.

Hutchinson, Minn.—The question of constructing two new bridges is being agitated.

Springfield, Mass.—Plans for a new bridge have been completed by Cy. Engr. Slocum.

Union, Pa.—A bridge across Susquehanna river, between this town and Vestal, is contemplated.

Sandy Creek, N. Y.—Plans have been prepared for a concrete steel bridge over Sandy Creek, in this town.

Danvers, Mass.—Plans for rebuilding the Hussey bridge over Water river have been accepted by the county commissioners.

Westport, Mass.—Plans for repairing the Westport Point bridge have been submitted. Wm. H. Gifford, chmn. bridge com.

Coshocton, O.—Bids are asked until Aug. 12 for the superstructure of a bridge over

Tuscarawas river at New Cumberstown. C. A. Lamberson, co. audt.

Wartburg, Tenn.—Bids are asked until Aug. 8 for building a steel bridge on steel tube piers at Oakdale. T. A. Morris, chmn. bridge com.

Ellicott City, Md.—Specifications have been prepared for a double truss bridge over Patuxent river at Triadelphia.

Williamsport, Pa.—Bids will be asked soon for a steel bridge over Moagland river in Lycoming twp.

Peru, Ind.—Bids are asked until Aug. 4 and 6 for concrete arch bridges. C. W. Macy, co. audt.

West Palmyra, N. J.—Plans are being made for a bridge over Pensauken creek. It will have 2 stone abutments.

St. Clair, O.—Bids are asked until Aug. 3 for the substructure of a bridge over McMahon's creek. A. W. Beatly, co. audt.

Trenton, N. J.—The county freeholders are considering the question of rebuilding four large bridges in Lawrence twp.

Brownstown, Ind.—Bids are asked until 1 p. m. Aug. 3 for building ten steel bridges and three stone sewers. Bd. co. comrs.

Lancaster, N. Y.—The question of erecting a new bridge at Penora-st., Depew and St. Mary's-st., this city, will be voted on.

Binghamton, N. Y.—This city voted a special tax levy of $57,000 for building the new Rockbottom bridge. S. L. Smith, mayor.

Jasper, Ala.—Bids are asked until Aug. 11 for a bridge over Lost Creek at the Price ford. James W. Shepherd, judge of probate.

Richmond, Mo.—Sealed bids are asked until 2 p. m. Aug. 5 for building stone piers across a ravine. W. A. Mullen, co. surveyor.

Ironton, O.—The property owners near Fleetwood park have petitioned for a wagon and foot bridge over Storm's creek at the foot of Eighth-st.

Columbia City, Ind.—Sealed bids are asked until 1 p. m. Aug. 5 for building four street bridges and one concrete and steel culvert. Bd. co. comrs.

Plymouth, Mass.—The county commissioners contemplate building a stone arch bridge over North river, between Pembroke and Hanover, this fall.

Fall River, Mass.—A committee of three has been appointed by the railroad commissioners, the harbor and land commissioners, and the county commissioners to select a chief engineer to supervise the construction of the proposed bridge across Taunton river, from Fall River to Somerset.

Buffalo, N. Y.—(Special.)—E. C. Rumrell was awarded the contract July 20 for the substructure for the subway in Clinton-st. under the West Shore and Buffalo creek railroads for $35,163.04. The Russell Wheel & Foundry Company secured the contract for the superstructure for $30,850.

Lower Merion, Pa.—A new bridge is contemplated at this place. A steel bridge on stone abutments is also proposed at Durland. R. C. Miller, co. clk, Norristown.

Shushan, N. Y.—The town boards of Jackson and Salem contemplate building four iron bridges across Battenkill, south of this place, to replace the wooden structures.

Sterling, Ill.—Sterling township voted July 21 to issue $27,500 for a new bridge below avenue G, and bids will be asked as soon as plans and specifications are prepared.

Janesville, Wis.—Sealed bids are asked until Aug. 8 for building a steel plate girder bridge across Rock river, 228 feet in length with 32 feet roadway, C. V. Kerch, cy. engr.

Pekin, Ill.—Sealed bids are asked until 12 m. Aug. 12, for the erection of four spans and for a superstructure for a highway bridge across the Illinois river at this place. Chas. J. Skaggs, cy. clk.; D. H. Jansen, cy. engr.

STREET LIGHTING.

Sioux Center, Ia.—This town voted to build a gas plant.

Burlington, N. C.—An electric light plant is contemplated.

Stockbridge, Mass.—An electric light plant is contemplated.

Wabash, Ind.—The installation of an electric plant is proposed.

Mankato, Minn.—The question of street lighting is being considered again.

Seward, Neb.—The citizens voted, July 15, to issue $7,000 bonds for an electric light plant.

Cherry Valley, Ill.—A franchise for an electric light plant has been granted C. K. Luhman.

Seattle, Wash.—Bids are asked until Aug. 11 for constructing a municipal electric light plant.

Ely, Minn.—The question of issuing bonds for extending the lighting system will be voted on Aug. 4.

Winnetka, Ill.—The city council has decided to appropriate $75,000 for building a municipal gas plant.

Indianapolis, Ind.—Sealed bids are asked until 10 a. m., Aug. 3, for lighting with gas and incandescent naptha lamps, certain streets, alleys, squares, avenues and other public places. Harold C. Megrew, chairman, board of public works.

Ford, Mich.—The contract for an electric light plant was awarded to the Michigan Electric Company for $3,337.

Conyers, Ga.—The question of constructing an electric light plant is being considered. John H. Almand, mayor.

Indianapolis, Ind.—Sealed bids are asked until 8 a. m., Aug. 3, for an electric light plant. E. J. Poursine, city clerk.

Barnesville, Ga.—Bids are asked until Aug. 3, for constructing a municipal electric light plant. J. S. Blalock, city clerk.

Logansport, Ind.—Sealed bids are asked until 12 m., Aug. 31, for furnishng two steam boilers of 350 horse power each. A. D. Fansler, city clerk.

Vidalia, La.—The citzens have presented a petition to council asking for an election on the issue of bonds for building an electric lght plant.

Palouse, Wash.—A twenty-five year franchise has been granted D. G. Klinefelter of Shelton, Wash., for installing, operating and maintaining within the city limts an electric light plant.

Lincoln, Neb.—The contract for lighting the residence portion of the city with 300 vapor gas lights was awarded July 6 to the Cleveland Vapor Light Company, of Cleveland, O., at $41 each per year.

PARKS.

Lake Park, Ia.—A new park will be established.

Galesburg, Ill.—The need of a new park is urged by the press.

Sterling, Ill.—Island Nos. 3 and 4 will be improved for park purposes.

Pueblo, Colo.—The purchase of 157 acres of land for a city park is contemplated.

Carthage, Mo.—Plans are being formulated for the improvement of the new park, which is to be known as Regan park.

Benton Harbor, Mich.—This town voted to appropriate $50,000 for the purchase of about 5 acres of land for a new park.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Burlington, Ia.—A garbage crematory is contemplated. Emmet Steece, cy. engr.

Ann Arbor, Mich.—The question of garbage disposal is being discussed. Mayor Brown.

St. Paul, Minn.—The city clerk has been directed to ask for bids for the purchase of additional sprinkling tanks.

Newark, N. J.—The contract for the removal of dead animals has been awarded to Andrew J. Kuhne for $2,000 a year for 5 years.

Buffalo, N. Y.—The contract for collecting and disposing of city ashes and garbage was awarded to the Buffalo Sanitary company for 5 yrs. for $164,000 a yr.

Grand Rapids, Mich.—The contract for collecting and hauling the garbage, refuse and dead animals for 3½ years was awarded July 20 to Edgar S. Kiefer, who will pay to the city $1,200 per year for the privilege.

Buffalo, N. Y.—(Special.)—The lowest bid submitted July 17 for cleaning the streets for 5 years was that of Gottfried Offerman, whose bid was as follows: Cleaning a square of asphalt, 10,000 sq. ft., 10¾c; cleaning square of rough pavement, 32c. He also bids 12½c a cu. yd. for removing snow and ice from the streets.

FIRE APPARATUS.

Red Lodge, Mont.—The purchase of a chemical -and hose wagon is contemplated.

Sterling, Ill.—The fire and water commission has been directed to ask for bids for a new hose wagon.

St. Clair City, Mich.—The question of installing a Gamewell fire alarm system is being discussed.

Bay City, Mich.—Resolutions have been adopted for the purchase of steamers and an aerial truck. Frank T. Woodworth, mayor.

Waukegan, Ill.—The question of repairing the present fire engine or of purchasing a new one is being discussed. H Thacker, cy. clk.

Perth Amboy, N. J.—Sealed bids are asked until 8:30 p. m. Aug. 3 for two combination chemical wagons, one hand hose wagon and one hook and ladder truck. John F. Rielley, cy. clk.

TOO LATE FOR CLASSIFICATION

Orange, Cal.—The citizens are in favor of installing a municipal water plant.

Webster Groves, Mo.—Sealed bids are asked until 8:30 p. m. Aug. 3 for improving Maple, Sylvester and Clark-aves. and Jackson road. A. B. Kaufman, st. comr.

Milwaukee, Wis.—Sealed bids are asked until 10:30 a. m. Aug. 4 for grading and macadamizing Concordia-ave. and Bremen-st. Chas. J. Poetsch, chmn. B. P. W.

Jasonville, Ind.—Sealed bids are asked until 7 p. m., Aug. 18, for improving Main and Meridian-sts. Pleasant Walters, president town.; E. E. West, town clk.

Paducah, Ky.—Sealed bids are asked until 12 m., Aug. 3, for reconstructing Second and Third-sts. with vitrified brick and for reconstructing 14 blocks of sidewalks. D. A. Yeison, mayor.

Sacramento, Cal.—Bids are asked until 1:30 p. m., Aug. 12, for constructing an earth embankment or training wall for directing the overflow from the Tisdale Weir to the Sutter Basin. W. P. Matthews, sec'y. auditing bd. to com'r. pub. wks.

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